SQL Interview Questions

**1. What is SQL?**

* **Answer:** SQL (Structured Query Language) is a standard programming language used to manage and manipulate relational databases. It allows users to perform operations such as querying, updating, inserting, and deleting data, as well as managing database structures like tables and indexes.

**2. What are the different types of SQL commands?**

* **Answer:** SQL commands are categorized into:
  + **DDL (Data Definition Language):** Commands like CREATE, ALTER, DROP, which define or modify database structures.
  + **DML (Data Manipulation Language):** Commands like SELECT, INSERT, UPDATE, DELETE, which manipulate data.
  + **DCL (Data Control Language):** Commands like GRANT, REVOKE, which control access to data.
  + **TCL (Transaction Control Language):** Commands like COMMIT, ROLLBACK, SAVEPOINT, which manage transactions.

**3. What is a Primary Key?**

* **Answer:** A Primary Key is a column (or a set of columns) in a table that uniquely identifies each row in that table. It must contain unique values and cannot contain NULL values.

**4. What is a Foreign Key?**

* **Answer:** A Foreign Key is a column (or a set of columns) in one table that links to the Primary Key in another table. It is used to enforce referential integrity between the two tables.

**5. What is a JOIN in SQL? Explain different types.**

* **Answer:** A JOIN clause is used to combine rows from two or more tables based on a related column between them. The different types of JOINs are:
  + **INNER JOIN:** Returns records that have matching values in both tables.
  + **LEFT (OUTER) JOIN:** Returns all records from the left table and the matched records from the right table.
  + **RIGHT (OUTER) JOIN:** Returns all records from the right table and the matched records from the left table.
  + **FULL (OUTER) JOIN:** Returns all records when there is a match in either left or right table.

**6. What is the difference between WHERE and HAVING clauses?**

* **Answer:** The WHERE clause is used to filter records before any groupings are made, while the HAVING clause is used to filter records after the grouping is done by the GROUP BY clause.

**7. How would you retrieve unique records from a table?**

* **Answer:** To retrieve unique records, you can use the DISTINCT keyword. For example

SELECT DISTINCT column\_name FROM table\_name;

**8. What is the use of the LIKE operator in SQL?**

* **Answer:** The LIKE operator is used in a WHERE clause to search for a specified pattern in a column. It is often used with wildcards:
  + % matches zero or more characters.
  + \_ matches exactly one character.

Example:

SELECT \* FROM employees WHERE name LIKE 'J%';

**9. What are aggregate functions in SQL?**

* **Answer:** Aggregate functions perform calculations on a set of values and return a single value. Common aggregate functions include:
  + COUNT(): Returns the number of rows.
  + SUM(): Returns the sum of values.
  + AVG(): Returns the average value.
  + MAX(): Returns the maximum value.
  + MIN(): Returns the minimum value.

**10. What is a subquery?**

* **Answer:** A subquery is a query nested inside another query. It is used to retrieve data that will be used in the main query. Subqueries can be used with SELECT, INSERT, UPDATE, and DELETE statements.

**11. What is constraint in a table?**

* **Answer:** A constraint in SQL is a rule applied to a table's columns to enforce data integrity and restrict the type of data that can be stored

**Intermediate SQL Questions**

**11. What is a view in SQL?**

* **Answer:** A view is a virtual table based on the result set of a SQL query. It contains rows and columns just like a real table but does not store the data physically. Views can simplify complex queries and provide a level of security by restricting access to certain data.

**12. How do you optimize a SQL query?**

* **Answer:** Query optimization techniques include:
  + Using indexes to speed up searches.
  + Avoiding SELECT \* and selecting only the necessary columns.
  + Using WHERE clauses to filter data early.
  + Avoiding correlated subqueries where possible.
  + Using JOINs instead of subqueries when appropriate.
  + Analyzing and refactoring complex queries.

**13. What is normalization? Explain different normal forms.**

* **Answer:** Normalization is the process of organizing the data in a database to reduce redundancy and improve data integrity. The normal forms are:
  + **1NF (First Normal Form):** Ensures that each column contains atomic values and that each record is unique.
  + **2NF (Second Normal Form):** Achieves 1NF and ensures that all non-key attributes are fully functionally dependent on the primary key.
  + **3NF (Third Normal Form):** Achieves 2NF and ensures that all the columns are not transitively dependent on the primary key.
  + **BCNF (Boyce-Codd Normal Form):** A stronger version of 3NF, where every determinant is a candidate key.

**14. Explain the difference between DELETE, TRUNCATE, and DROP.**

* **Answer:**
  + DELETE: Removes rows from a table based on a condition. It can be rolled back (if within a transaction).
  + TRUNCATE: Removes all rows from a table but does not delete the table structure. It is faster than DELETE and cannot be rolled back.
  + DROP: Deletes the entire table, including its structure and data, and cannot be rolled back.

**15. What are transactions in SQL, and what are their properties?**

* **Answer:** A transaction is a sequence of one or more SQL operations treated as a single unit. Transactions have four properties, known as ACID:
  + **Atomicity:** Ensures that all operations within a transaction are completed; if not, the transaction is aborted.
  + **Consistency:** Ensures that a transaction brings the database from one valid state to another.
  + **Isolation:** Ensures that transactions are executed in isolation from other transactions.
  + **Durability:** Ensures that once a transaction is committed, the changes are permanent.

**Advanced SQL Questions**

**16. What is indexing, and how does it improve query performance?**

* **Answer:** Indexing is a technique used to speed up the retrieval of rows from a table. An index creates a data structure that allows the database to locate rows more quickly, avoiding full table scans. However, too many indexes can slow down INSERT, UPDATE, and DELETE operations.

**17. What is a stored procedure, and how is it different from a function?**

* **Answer:** A stored procedure is a prepared SQL code that can be saved and reused. It can accept parameters, execute queries, and return results. A function is similar but generally used to perform calculations and return a single value. Functions must return a value, whereas stored procedures may or may not.

**18. How do you handle errors in SQL?**

* **Answer:** Errors in SQL can be handled using TRY...CATCH blocks (in databases like SQL Server). Within the CATCH block, you can use the ERROR\_MESSAGE() function to get details about the error.

**19. What is partitioning in SQL, and why is it used?**

* **Answer:** Partitioning is the process of dividing a large table into smaller, more manageable pieces (partitions), which can improve performance, particularly for queries and maintenance tasks. There are different types of partitioning, such as range, list, and hash partitioning.

**20. Explain the concept of CTE (Common Table Expression).**

* **Answer:** A CTE is a temporary result set that can be referenced within a SELECT, INSERT, UPDATE, or DELETE statement. It is defined using the WITH keyword. CTEs improve readability and maintainability, and they can be recursive, making them useful for hierarchical data queries.

**Difference between MySQL and SQL?**

**Definition:** SQL is a standard programming language used to manage and manipulate relational databases. It provides the commands necessary to perform operations like querying, updating, inserting, and deleting data, as well as defining and managing database structures.

**Purpose:** SQL is used to communicate with databases and execute various tasks such as retrieving data, creating tables, and managing permissions.

**Definition:** MySQL is an open-source relational database management system (RDBMS) that uses SQL as its language for interacting with the database. It is widely used for web applications and is known for its performance, reliability, and ease of use.

**Purpose:** MySQL manages databases by providing a server environment where SQL commands can be executed to store, retrieve, and manage data.

**SQL** is the language used to interact with databases, while **MySQL** is a database management system that implements SQL.

**what are clause in mysql?**

1. SELECT Clause.
2. FROM Clause.
3. WHERE Clause.
4. ORDER BY Clause.
5. GROUP BY Clause.
6. HAVING Clause.
7. JOIN Clause.
8. LIMIT Clause.
9. INSERT INTO Clause.
10. UPDATE Clause.
11. DELETE FROM Clause.
12. ALTER TABLE Clause.
13. DISTINCT Clause.