

# SQL & MySQL Interview Questions and Answers

## (Batch 1: 1–50)

### Basics of SQL

#### 1. What is SQL?

SQL (Structured Query Language) is a standard language used to manage and manipulate relational databases. It allows users to insert, query, update, and delete data.

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

- **DDL** – Data Definition Language ( `CREATE` , `ALTER` , `DROP` )
- **DML** – Data Manipulation Language ( `SELECT` , `INSERT` , `UPDATE` , `DELETE` )
- **DCL** – Data Control Language ( `GRANT` , `REVOKE` )
- **TCL** – Transaction Control Language ( `COMMIT` , `ROLLBACK` , `SAVEPOINT` )

#### 3. What is a primary key?

A primary key uniquely identifies each row in a table. It cannot contain NULL values and must be unique.

#### 4. What is a foreign key?

A foreign key links two tables and establishes a relationship. It points to the primary key in another table.

#### 5. Difference between `WHERE` and `HAVING` ?

- `WHERE` : filters rows before grouping.
- `HAVING` : filters groups after grouping.

#### 6. What is a JOIN in SQL?

JOIN is used to combine rows from two or more tables based on a related column.

#### 7. Types of JOINS?

- INNER JOIN
- LEFT JOIN (or LEFT OUTER JOIN)
- RIGHT JOIN (or RIGHT OUTER JOIN)
- FULL OUTER JOIN
- CROSS JOIN

## 8. What is normalization?

Normalization organizes data to reduce redundancy and improve data integrity by dividing tables into smaller ones.

## 9. What is denormalization?

Denormalization is the process of combining tables to optimize read performance, often at the expense of redundancy.

## 10. What is a subquery?

A subquery is a query within another SQL query. It can be used in SELECT, INSERT, UPDATE, or DELETE statements.

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# Intermediate SQL

## 11. Difference between UNION and UNION ALL ?

- UNION : removes duplicates.
- UNION ALL : includes duplicates.

## 12. What is a view?

A view is a virtual table based on the result-set of an SQL statement. It doesn't store data physically.

## 13. Can a view be updated?

Yes, but with restrictions. The view must be based on one table without aggregate functions.

## 14. What is an index?

Indexes improve query performance by allowing faster data retrieval.

## 15. Types of indexes in SQL?

- Clustered Index
- Non-clustered Index
- Composite Index
- Unique Index
- Full-text Index (MySQL)

## 16. What is the difference between clustered and non-clustered index?

- Clustered index sorts and stores data rows in the table.
- Non-clustered index has a separate structure and points to the data.

## 17. How is NULL treated in SQL?

NULL represents missing or unknown data. NULL <> NULL and comparison with NULL requires IS NULL .

## 18. What is the difference between `DELETE` , `TRUNCATE` , and `DROP` ?

- `DELETE` : removes specific rows, can be rolled back.
- `TRUNCATE` : removes all rows, can't be rolled back (in most DBMS).
- `DROP` : removes the table structure and data.

## 19. How do you fetch unique records?

Using `SELECT DISTINCT column_name FROM table_name;`

## 20. What is a constraint?

Constraints enforce rules on data in tables like `NOT NULL` , `UNIQUE` , `CHECK` , `DEFAULT` , etc.

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# MySQL-Specific

## 21. Difference between MySQL and SQL?

- SQL is a language.
- MySQL is a database system that uses SQL.

## 22. What is `AUTO_INCREMENT` in MySQL?

It automatically increments numeric fields, typically used for primary keys.

## 23. What storage engines are used in MySQL?

- InnoDB (default, supports transactions, foreign keys)
- MyISAM (fast, no transactions support)

## 24. How do you create a user in MySQL?

```
CREATE USER 'username'@'localhost' IDENTIFIED BY 'password';
```

## 25. How to grant privileges in MySQL?

```
GRANT ALL PRIVILEGES ON dbname.* TO 'username'@'localhost';
```

## 26. How to show tables in a MySQL database?

```
SHOW TABLES;
```

## 27. How to switch databases in MySQL?

```
USE database_name;
```

## 28. Difference between **CHAR** and **VARCHAR** ?

- **CHAR** : fixed length
- **VARCHAR** : variable length

## 29. How to list all databases in MySQL?

```
SHOW DATABASES;
```

## 30. How to check MySQL version?

```
SELECT VERSION();
```

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# Advanced Concepts

## 31. What is ACID in databases?

- **Atomicity, Consistency, Isolation, Durability** – principles to ensure reliable transactions.

## 32. What are transactions?

A transaction is a unit of work performed within a database. Use **BEGIN** , **COMMIT** , and **ROLLBACK** .

## 33. What is a trigger?

A trigger is a stored procedure that runs automatically when certain events occur (e.g., INSERT, UPDATE).

## 34. What is a stored procedure?

A set of SQL statements with a name that can be called repeatedly.

## 35. What is the difference between a function and a stored procedure?

- Functions return a value.
- Stored procedures may or may not return values.

## 36. What is a cursor in SQL?

A cursor is used to retrieve, manipulate, and navigate row-by-row results from a query.

## 37. What is a composite key?

A primary key made up of two or more columns.

### 38. What is a unique constraint?

Ensures all values in a column or group of columns are unique.

### 39. What is an alias in SQL?

Used to give a table or column a temporary name:

```
SELECT first_name AS Name FROM users;
```

### 40. How to fetch current date and time in SQL?

```
SELECT NOW();
```

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## Scenario-Based Questions

### 41. Write a query to find the second highest salary.

```
SELECT MAX(salary) FROM employees WHERE salary < (SELECT MAX(salary) FROM
```

### 42. How to find duplicate records?

```
SELECT column_name, COUNT(*) FROM table_name GROUP BY column_name HAVING
```

### 43. How do you handle NULLs in aggregate functions?

Most aggregate functions ignore NULLs. Use `COALESCE()` to handle them explicitly.

### 44. How to rename a column in SQL?

```
ALTER TABLE table_name RENAME COLUMN old_name TO new_name;
```

### 45. How do you get the count of records in a table?

```
SELECT COUNT(*) FROM table_name;
```

### 46. What is the use of the `IFNULL()` function?

Returns the specified value if the expression is NULL.

```
SELECT IFNULL(column, 'Default') FROM table;
```

#### 47. How do you find the number of rows affected by a query?

Use `ROW_COUNT()` in MySQL or check affected rows in your DB tool.

#### 48. What is the difference between `BETWEEN` and `IN` ?

- `BETWEEN` : for a range of values
- `IN` : for a list of discrete values

#### 49. Write a query to fetch employees who joined in the last 30 days.

```
SELECT * FROM employees WHERE join_date >= CURDATE() - INTERVAL 30 DAY;
```

#### 50. How to change the datatype of a column?

```
ALTER TABLE table_name MODIFY column_name NEW_DATATYPE;
```

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## SQL & MySQL Interview Questions and Answers (Batch 2: 51–100)

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### Advanced SQL & Performance

#### 51. What is a correlated subquery?

A subquery that references columns from the outer query.

```
SELECT e1.name FROM employees e1 WHERE salary > (SELECT AVG(salary) FROM
```

#### 52. What is the difference between `EXISTS` and `IN` ?

- `IN` : checks for a value in a list or result set.
- `EXISTS` : returns true if a subquery returns any rows (faster for correlated queries).

#### 53. What is a window function?

Performs calculations across a set of rows related to the current row.

```
SELECT name, salary, RANK() OVER (ORDER BY salary DESC) FROM employees;
```

#### 54. What is the use of `RANK()` , `DENSE_RANK()` , and `ROW_NUMBER()` ?

Used in window functions to assign a unique rank or number to rows.

#### 55. How to optimize a slow SQL query?

- Use indexes
- Avoid `SELECT *`
- Use `WHERE` clauses
- Avoid unnecessary joins
- Analyze query plans

#### 56. What is `EXPLAIN` in SQL?

It shows the execution plan for a query. Helps identify performance issues.

#### 57. How do indexes affect performance?

Indexes speed up `SELECT` queries but slow down `INSERT` , `UPDATE` , `DELETE` .

#### 58. What is a covering index?

An index that includes all columns needed by a query, avoiding table lookup.

#### 59. How to prevent SQL injection?

- Use parameterized queries
- Avoid string concatenation
- Sanitize inputs

#### 60. Difference between `CHAR_LENGTH()` and `LENGTH()` ?

- `CHAR_LENGTH()` : character count
- `LENGTH()` : byte count (differs with multibyte characters)

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## Real-World Scenarios

#### 61. How to find employees who don't have a manager?

```
SELECT * FROM employees WHERE manager_id IS NULL;
```

#### 62. How do you update data from one table to another?

```
UPDATE t1 JOIN t2 ON t1.id = t2.id SET t1.name = t2.name;
```

#### 63. How to insert data from one table to another?

```
INSERT INTO new_table (col1, col2) SELECT col1, col2 FROM old_table;
```

#### 64. How to get top N records?

```
SELECT * FROM table ORDER BY salary DESC LIMIT 5;
```

#### 65. How to find nth highest salary using **LIMIT** ?

```
SELECT DISTINCT salary FROM employees ORDER BY salary DESC LIMIT 1 OFFSET
```

#### 66. How to find employees with duplicate names?

```
SELECT name, COUNT(*) FROM employees GROUP BY name HAVING COUNT(*) > 1;
```

#### 67. How to delete duplicate records?

Use **ROW\_NUMBER()** or **GROUP BY** with **MIN(id)** to preserve one record.

#### 68. How to write a recursive query?

Use **WITH RECURSIVE** for hierarchical data:

```
WITH RECURSIVE cte AS (  
    SELECT id, name, manager_id FROM employees WHERE manager_id IS NULL  
    UNION ALL  
    SELECT e.id, e.name, e.manager_id FROM employees e  
    INNER JOIN cte ON e.manager_id = cte.id  
)  
SELECT * FROM cte;
```

#### 69. What is the difference between **DELETE** and **DROP** ?

- **DELETE** : removes data
- **DROP** : removes table structure and data

#### 70. How do you find the most common value in a column?

```
SELECT column, COUNT(*) AS freq FROM table GROUP BY column ORDER BY freq
```

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## Functions & Expressions



## 71. What is **COALESCE()** in SQL?

Returns the first non-null value in a list.

```
SELECT COALESCE(middle_name, 'N/A');
```

## 72. What is **CASE** statement in SQL?

Used for conditional logic:

```
SELECT name, salary,  
       CASE WHEN salary > 50000 THEN 'High' ELSE 'Low' END AS status  
FROM employees;
```

## 73. What is the difference between **IS NULL** and **= NULL**?

**= NULL** does not work. Use **IS NULL** or **IS NOT NULL**.

## 74. How to concatenate two columns?

```
SELECT CONCAT(first_name, ' ', last_name) AS full_name FROM users;
```

## 75. How to calculate age from DOB in SQL?

```
SELECT name, TIMESTAMPDIFF(YEAR, dob, CURDATE()) AS age FROM users;
```

## 76. How to round decimal values?

```
SELECT ROUND(salary, 2) FROM employees;
```

## 77. What is the use of **GROUP\_CONCAT()** in MySQL?

Combines values from multiple rows into a single string.

```
SELECT department, GROUP_CONCAT(name) FROM employees GROUP BY department;
```

## 78. What does **FIND\_IN\_SET()** do in MySQL?

Finds the position of a string in a comma-separated string.

```
SELECT FIND_IN_SET('a', 'a,b,c'); -- returns 1
```

### 79. What is the use of `DATE_FORMAT()` ?

Formats date values:

```
SELECT DATE_FORMAT(NOW(), '%d-%m-%Y');
```

### 80. How do you check if a column exists in a table?

```
SHOW COLUMNS FROM table_name LIKE 'column_name';
```

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## Miscellaneous + Best Practices

### 81. How do you back up a MySQL database?

Using `mysqldump` :

```
mysqldump -u root -p dbname > backup.sql
```

### 82. What is the difference between logical and physical data independence?

- Logical: change schema without changing applications
- Physical: change storage without affecting schema

### 83. What are temp tables in SQL?

Temporary tables that exist during the session.

```
CREATE TEMPORARY TABLE temp_name (...);
```

### 84. What are derived tables?

Subqueries used as temporary tables in the `FROM` clause.

### 85. What is the use of `LIMIT` with `OFFSET` ?

Used for pagination:

```
SELECT * FROM table LIMIT 10 OFFSET 20;
```

### 86. What are wildcards in SQL?

Used with `LIKE` : `%` (any characters), `_` (single character).

### 87. What is a schema in SQL?

A logical container for database objects like tables, views, procedures.

### 88. What is a surrogate key?

An artificially created key (like an auto-increment ID).

### 89. How to count rows by group?

```
SELECT department, COUNT(*) FROM employees GROUP BY department;
```

### 90. How to rename a table in SQL?

```
RENAME TABLE old_name TO new_name;
```

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## Real-time Case-Based Questions

### 91. Write a query to find departments with more than 5 employees.

```
SELECT department_id, COUNT(*) FROM employees GROUP BY department_id HAVING COUNT(*) > 5;
```

### 92. How to perform an INNER JOIN between 3 tables?

```
SELECT * FROM A
JOIN B ON A.id = B.a_id
JOIN C ON B.id = C.b_id;
```

### 93. How to copy table structure without data?

```
CREATE TABLE new_table LIKE old_table;
```

### 94. How to get only even IDs from a table?

```
SELECT * FROM table WHERE MOD(id, 2) = 0;
```

### 95. How to find the difference between two dates in days?

```
SELECT DATEDIFF(date1, date2);
```

### 96. How to get a list of all indexes on a table in MySQL?

```
SHOW INDEXES FROM table_name;
```

**97. Write a query to retrieve employees who earn above average salary.**

```
SELECT * FROM employees WHERE salary > (SELECT AVG(salary) FROM employees
```

**98. What is JSON datatype in MySQL?**

Stores JSON-formatted data and allows querying using `JSON_EXTRACT`, etc.

**99. How to extract values from JSON fields in MySQL?**

```
SELECT JSON_EXTRACT(json_column, '$.name') FROM table;
```

**100. How to find last record inserted into a table?**

Assuming `id` is `AUTO_INCREMENT`:

```
SELECT * FROM table ORDER BY id DESC LIMIT 1;
```

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