

1. Basic SQL (Core Fundamentals)

- Data types (numeric, string, date/time, etc.)
- SELECT, FROM, WHERE
- Logical operators: AND, OR, NOT
- Comparison operators: =, !=, <, >, BETWEEN, IN, LIKE
- ORDER BY
- DISTINCT
- LIMIT / TOP / FETCH (depending on DBMS)

2. Joins & Relationships

- INNER JOIN
- LEFT JOIN / RIGHT JOIN
- FULL OUTER JOIN
- SELF JOIN
- CROSS JOIN
- Multi-table joins
- Understanding primary/foreign keys and referential integrity

3. Aggregations & Grouping

- GROUP BY
- HAVING
- Aggregation functions: COUNT, SUM, AVG, MIN, MAX
- Combining aggregates with joins and subqueries

4. Subqueries

- Scalar subqueries
- Correlated subqueries
- IN, EXISTS, NOT EXISTS
- Subqueries in SELECT, FROM, and WHERE clauses

- Common Table Expressions (CTEs) using WITH

5. Set Operations

- UNION, UNION ALL
- INTERSECT
- EXCEPT / MINUS

6. Data Manipulation (DML)

- INSERT, UPDATE, DELETE
- MERGE (especially in SQL Server/Oracle)
- Bulk insert and data import

7. Data Definition (DDL)

- CREATE TABLE, ALTER TABLE, DROP TABLE
- CREATE INDEX, DROP INDEX
- Constraints: PRIMARY KEY, FOREIGN KEY, UNIQUE, CHECK, DEFAULT, NOT NULL

8. Views & Indexes

- CREATE VIEW, ALTER VIEW, DROP VIEW
- Read-only vs updatable views
- Indexing basics and performance implications
- Composite indexes and covering indexes

9. Transactions & Concurrency

- BEGIN, COMMIT, ROLLBACK
- Isolation levels: READ COMMITTED, READ UNCOMMITTED, REPEATABLE READ, SERIALIZABLE
- Deadlocks and transaction conflicts

10. Functions & Expressions

- String functions: CONCAT, SUBSTRING, TRIM, REPLACE, LOWER, UPPER

- Date/time functions: NOW, DATEADD, DATEDIFF, TO_DATE, CURRENT_TIMESTAMP
- Math functions: ROUND, FLOOR, CEILING, ABS, MOD
- Conversion functions: CAST, CONVERT

11. Advanced Topics

- Window (Analytic) Functions: ROW_NUMBER(), RANK(), DENSE_RANK(), LEAD(), LAG(), NTILE(), OVER(), PARTITION BY
- Recursive queries using WITH RECURSIVE
- Dynamic SQL (if applicable)
- JSON/XML functions (for PostgreSQL, SQL Server, etc.)

12. Optimization & Performance

- Query execution plans (EXPLAIN)
- Index tuning
- Normalization & denormalization
- Avoiding N+1 queries
- Efficient joins and subquery strategies

13. Security & Permissions

- User roles and permissions (GRANT, REVOKE)
- SQL injection awareness and prevention

14. Procedural SQL / Stored Programs

- Stored Procedures
- Functions
- Triggers
- Cursors
- Error handling with TRY...CATCH or BEGIN...EXCEPTION

Optional (Based on DBMS)

- Partitioning

- Materialized Views
- In-Memory Tables
- Temporal Tables
- Spatial Queries (GIS)