

MySQL Roadmap (Basic → Advanced, for 8+ Years)

1. Fundamentals

- Introduction to RDBMS & MySQL: architecture, storage engines.
- Database Objects: Tables, Views, Schemas.
- Data Types: Numeric, Strings, Date/Time, JSON.
- SQL Basics: SELECT, INSERT, UPDATE, DELETE.
- Joins: INNER, LEFT, RIGHT, CROSS, SELF.
- Clauses: WHERE, GROUP BY, HAVING, ORDER BY, LIMIT.
- Functions: String, Numeric, Date, NULL handling.

2. Schema Design & Data Modeling

- Normalization (1NF–5NF, BCNF), denormalization trade-offs.
- Keys & Constraints: PK, FK, Unique, Check, Default.
- Indexes: single, composite, covering, FULLTEXT.
- Partitioning: RANGE, LIST, HASH, KEY.
- Data type choices and best practices.

3. Advanced Querying & Optimization

- Subqueries: correlated, EXISTS, IN.
- Common Table Expressions (CTE).
- Window Functions: ROW_NUMBER, RANK, LEAD, LAG.
- Stored Procedures, Functions, Triggers, Events.
- Query Plans: EXPLAIN, EXPLAIN ANALYZE.
- Query Optimization: avoid SELECT *, non-SARGable queries.

4. Transactions & Concurrency

- ACID properties.
- Transaction control: COMMIT, ROLLBACK, Savepoints.
- Isolation Levels: Read Uncommitted, Committed, Repeatable Read, Serializable.
- Concurrency control: Row vs Table locks, deadlocks, MVCC.
- InnoDB Locking Internals.

5. Indexing & Performance Tuning

- Index Internals: B-Tree, Hash, clustered vs non-clustered.
- Profiling: SHOW PROFILES, STATUS, Performance Schema.
- Optimizer Hints: STRAIGHT_JOIN, FORCE INDEX.
- Caching: query cache, app-level caching.
- Sharding & Partitioning.

6. Security & User Management

- User Management: CREATE/ALTER/DROP USER.
- Privileges: GRANT, REVOKE, Roles.
- Best Practices: least privilege, SSL/TLS, encryption.
- SQL Injection prevention: prepared statements.
- Auditing: logs, plugins.

7. High Availability & Scalability

- Replication: statement vs row-based, GTIDs, async vs semi-sync.
- Clustering: InnoDB Cluster, NDB, Galera.
- Failover & Load Balancing: ProxySQL, HAProxy.
- Backup & Recovery: mysqldump, XtraBackup, PITR.

8. MySQL Internals

- Storage Engines: InnoDB vs MyISAM vs MEMORY.

- InnoDB Internals: buffer pool, redo/undo logs, change buffer.
- Query execution lifecycle.
- Optimizer internals: join order, statistics.

9. Modern Features

- JSON functions: JSON_EXTRACT, JSON_ARRAYAGG.
- Generated Columns: stored vs virtual.
- GIS: POINT, POLYGON, spatial indexes.
- CTE & Window Functions.

10. Tooling & Ecosystem

- Admin Tools: MySQL Workbench, Percona Toolkit.
- Monitoring: PMM, Performance Schema, Grafana+Prometheus.
- ORM Integration: Hibernate, Sequelize, Django ORM.
- DevOps: MySQL in Docker, Kubernetes operators, automated backups.