

MYSQL

Notes

A deep-dive into Structured Query Language (SQL), relational database design, indexing strategies, and performance optimization.



MySQL Notes

What is a Database?

A **database** is a structured collection of interrelated data stored together to serve multiple applications.

MySQL Elements

Literals

Literals refer to fixed data values:

```
17      -- Numeric literal
'Samir'  -- Text literal
12.5    -- Real literal
```

Data Types

MySQL provides several data types:

```
# Numeric Types
TINYINT, SMALLINT, MEDIUMINT, INT, BIGINT
FLOAT(M,D), DOUBLE(M,D), DECIMAL(M,D)

# Date/Time Types
DATE      -- YYYY-MM-DD
DATETIME  -- YYYY-MM-DD HH:MM:SS
TIME      -- HH:MM:SS
```

```
YEAR          -- YYYY
```

String/Text Types

```
CHAR(M)       -- Fixed-length string
```

```
VARCHAR(M)    -- Variable-length string
```

```
TEXT          -- Large text
```

```
BLOB          -- Binary large object (for files/images)
```

```
ENUM('x','y') -- One value from a defined set
```

```
SET('x','y')  -- Multiple values from a defined set
```

NULL Values

NULL represents missing/unknown data.

Comments

```
/* Multi-line comment */
```

```
# Single-line comment
```

```
-- Single-line comment
```

MySQL Calculations

```
SELECT 5+8;    -- Addition
```

```
SELECT 15-5;   -- Subtraction
```

```
SELECT 5*5;    -- Multiplication
```

```
SELECT 24/4;   -- Division
```

Tip: SQL is **case-insensitive**, but keywords are usually written in UPPERCASE for readability.

Accessing Databases

```
SHOW DATABASES;      -- List all databases
USE database_name;    -- Switch to a database
SHOW TABLES;        -- List all tables in the current database
```

Creating Tables

```
CREATE TABLE table_name (
    column1 datatype,
    column2 datatype,
    column3 datatype
);
```

Inserting Data

```
INSERT INTO table_name (col1, col2) VALUES (val1, val2);
INSERT INTO table_name VALUES (val1, val2, val3); -- All columns
INSERT INTO table_name (col1, col2, col3) VALUES (val1, val2, NULL); -- NULL insert
INSERT INTO table_name (date_col) VALUES ('2021-12-10'); -- Date insert
```

Retrieving Data (SELECT)

```
SELECT * FROM table_name;      -- All columns
SELECT col1, col2 FROM table_name; -- Specific columns
SELECT DISTINCT col1 FROM table_name; -- Unique values
SELECT col1, col2 AS alias FROM table_name; -- Column alias
SELECT * FROM table_name WHERE condition; -- Filter rows
SELECT * FROM table_name WHERE col BETWEEN 10 AND 20; -- Range filter
```

```
SELECT * FROM table_name WHERE col IN (1,2,3); -- List match
SELECT * FROM table_name WHERE col NOT IN (1,2,3);
SELECT * FROM table_name WHERE col LIKE 'Ha%'; -- Pattern match
SELECT * FROM table_name WHERE col IS NULL; -- NULL search
```

Constraints

```
NOT NULL -- Disallow NULL
DEFAULT -- Set default value
UNIQUE -- Ensure unique values
CHECK (condition) -- Ensure condition is true
PRIMARY KEY(col1) -- Unique + Not Null
FOREIGN KEY (col) REFERENCES other_table(col)
```

Modifying Data

```
UPDATE table_name
SET col1 = new_value, col2 = new_value
WHERE condition;
```

Deleting Data

```
DELETE FROM table_name WHERE condition;
```

Ordering Results

```
SELECT * FROM table_name ORDER BY col ASC;  
SELECT * FROM table_name ORDER BY col DESC;  
SELECT * FROM table_name ORDER BY col1 ASC, col2 DESC;
```

Grouping Data

```
SELECT col, COUNT(*) FROM table_name GROUP BY col;  
SELECT col, AVG(salary) FROM table_name GROUP BY col HAVING AVG(salary) > 50000;
```

Altering Table Structure

```
ALTER TABLE table_name ADD new_column datatype;  
ALTER TABLE table_name MODIFY column_name datatype;  
ALTER TABLE table_name CHANGE old_name new_name datatype;
```

Dropping Table

```
DROP TABLE table_name;
```

MySQL Functions

String Functions

```
SELECT CHAR(72,97,114,114,121);
SELECT CONCAT('Saurabh','Samir');
SELECT LOWER('Samir');
SELECT UPPER('LearnFrenzy');
SELECT SUBSTRING('HelloWorld', 1, 5);
SELECT TRIM('  Samir ');
SELECT INSTR('LearnFrenzy','Samir');
SELECT LENGTH('Samir');
```

Numeric Functions

```
SELECT MOD(11,4);
SELECT POWER(2,3);
SELECT ROUND(15.193,1);
SELECT SQRT(144);
SELECT TRUNCATE(15.75,1);
```

Date/Time Functions

```
SELECT CURDATE();
SELECT NOW();
SELECT DATE('2021-12-10 12:00:00');
SELECT YEAR(NOW());
SELECT MONTH(NOW());
SELECT DAY(NOW());
SELECT SYSDATE();
```

Aggregate Functions

```
SELECT AVG(col) FROM table_name;
SELECT COUNT(*) FROM table_name;
SELECT MAX(col) FROM table_name;
```

```
SELECT MIN(col) FROM table_name;  
SELECT SUM(col) FROM table_name;
```

Joins

```
-- Inner Join  
SELECT t1.col, t2.col  
FROM table1 t1  
INNER JOIN table2 t2 ON t1.id = t2.id;  
  
-- Left Join  
SELECT ...  
FROM table1  
LEFT JOIN table2 ON table1.id = table2.id;  
  
-- Right Join  
SELECT ...  
FROM table1  
RIGHT JOIN table2 ON table1.id = table2.id;  
  
-- Full Join (MySQL Workaround)  
SELECT ...  
FROM table1  
LEFT JOIN table2 ON table1.id=table2.id  
UNION  
SELECT ...  
FROM table1  
RIGHT JOIN table2 ON table1.id=table2.id;  
  
-- Self Join  
SELECT a.col, b.col  
FROM table a, table b  
WHERE a.id < b.id;
```

Indexes (Performance)

```
CREATE INDEX idx_name ON table_name(column_name);  
DROP INDEX idx_name ON table_name;  
SHOW INDEX FROM table_name;
```

Views (Virtual Tables)

```
CREATE VIEW view_name AS SELECT col1, col2 FROM table_name WHERE condition;  
DROP VIEW view_name;
```

Transactions (Atomic Operations)

```
START TRANSACTION;  
UPDATE accounts SET balance = balance - 500 WHERE id = 1;  
UPDATE accounts SET balance = balance + 500 WHERE id = 2;  
COMMIT; -- Save changes  
ROLLBACK; -- Undo changes
```

User Management & Privileges

```
CREATE USER 'username'@'localhost' IDENTIFIED BY 'password';  
GRANT ALL PRIVILEGES ON dbname.* TO 'username'@'localhost';  
FLUSH PRIVILEGES;
```
