

CUET · COMPUTER SCIENCE · CLASS XI · CODE 308

# Introduction to Structured Query Language (SQL)

CUET unit: Introduction to Structured Query Language (SQL)

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## Snapshot

- SQL is the standard query language for Relational Database Management Systems (RDBMS); MySQL is the working environment.
- The full DDL–DML–DQL cycle covers: creating databases and tables (DDL), inserting, updating and deleting records (DML), and querying with SELECT (DQL).
- SQL syntax, data types, constraints, and SELECT clause operators (WHERE, BETWEEN, IN, LIKE, ORDER BY, DISTINCT, IS NULL) are direct, objective-answer topics, so CUET tests them heavily.
- A running example — the `StudentAttendance` database with relations STUDENT, GUARDIAN and ATTENDANCE — illustrates every concept, making it ideal for case-based MCQs.
- Data updation (UPDATE) and deletion (DELETE) complete every core RDBMS operation a Class XI student needs to know for CUET.

## Detailed Notes

### 2.1 Core concepts

- **What is SQL?** SQL (Structured Query Language) is the most popular query language used by major RDBMS such as MySQL, ORACLE, and SQL Server. Unlike file-system programs, SQL lets a user specify **what** to retrieve rather than **how** to retrieve it. SQL covers data definition, data manipulation, constraints, and data retrieval. (NCERT §8.2, p. 144)
- **MySQL basics:** MySQL is open-source RDBMS software. After installation and starting the MySQL service, the `mysql>` prompt appears. SQL statements are case-insensitive; every statement ends with a semicolon ( ; ). Multi-line statements use `->` as the continuation prompt until ; is typed. (NCERT §8.2.1, p. 144–145)
- **Data types — CHAR(n):** Fixed-length character data; length 0–255. If actual data is shorter, MySQL pads remaining spaces on the right. Suitable when stored strings always have the same length (e.g., a 12-digit Aadhaar number as CHAR(12)). (NCERT §8.3.1, Table 8.1, p. 145)
- **Data types — VARCHAR(n):** Variable-length character data; length 0–65535. Only the actual bytes needed are stored, so VARCHAR(30) storing 'city' uses 4-character

- space. More space-efficient than CHAR for variable-length data like names. (NCERT §8.3.1, Table 8.1, p. 145)
- **Data types — INT:** Integer value occupying 4 bytes; range –2147483648 to 2147483647. Use BIGINT (8 bytes) for larger values. Suitable for roll numbers, IDs. (NCERT §8.3.1, Table 8.1, p. 146)
  - **Data types — FLOAT:** Numbers with decimal points; 4 bytes of storage. (NCERT §8.3.1, Table 8.1, p. 146)
  - **Data types — DATE:** Stores dates in 'YYYY-MM-DD' format. Supported range: '1000-01-01' to '9999-12-31'. (NCERT §8.3.1, Table 8.1, p. 146)
  - **Constraints:** Constraints restrict the data values an attribute can hold, ensuring accuracy and reliability. It is not mandatory to define a constraint for every attribute. Five constraints are covered: NOT NULL (column cannot be empty), UNIQUE (all values in column are distinct), DEFAULT (a pre-set value used when no value is supplied), PRIMARY KEY (uniquely identifies each row; combines NOT NULL + UNIQUE implicitly), and FOREIGN KEY (references the primary key of another table). (NCERT §8.3.2, Table 8.2, p. 146)
  - **DDL — CREATE DATABASE:** CREATE DATABASE databasename; creates a new database. The USE databasename; statement selects it as the active database. SHOW TABLES; lists all tables in the active database. (NCERT §8.4.1, p. 146–147)
  - **DDL — CREATE TABLE:** Defines a relation with attribute names, data types, and optional constraints. Syntax: CREATE TABLE tablename (attr1 datatype constraint, attr2 datatype constraint, ...); .N attributes means the relation has degree N. By default, each attribute can take NULL except primary key attributes. (NCERT §8.4.2, p. 147–148)
  - **Relation schemas used in chapter:** STUDENT (RollNumber INT PK, SName VARCHAR(20) NOT NULL, SDateofBirth DATE NOT NULL, GUID CHAR(12) FK); GUARDIAN (GUID CHAR(12) PK, GName VARCHAR(20) NOT NULL, GPhone CHAR(10) NULL UNIQUE, GAddress VARCHAR(30) NOT NULL); ATTENDANCE (AttendanceDate DATE PK, RollNumber INT PK + FK, AttendanceStatus CHAR(1) NOT NULL). The asterisk (\*) denotes composite primary key. (NCERT §8.3, Tables 8.3–8.5, p. 148)
  - **DDL — DESCRIBE/DESC:** DESCRIBE tablename; or DESC tablename; displays the structure of an existing table (field names, types, null, key, default, extra). (NCERT §8.4.3, p. 149)
  - **DDL — ALTER TABLE:** Modifies the structure of an existing table. Operations include: ADD PRIMARY KEY, ADD FOREIGN KEY ... REFERENCES, ADD UNIQUE, ADD attribute, MODIFY attribute datatype, MODIFY attribute datatype NOT NULL (to change constraint), MODIFY attribute datatype DEFAULT value, DROP attribute, DROP PRIMARY KEY. (NCERT §8.4.4, p. 149–152)

- **DDL — DROP:** `DROP TABLE tablename;` permanently removes a table (and all its data). `DROP DATABASE databasename;` removes the entire database including all tables. This action cannot be undone. (NCERT §8.4.5, p. 153)
- **DML — INSERT INTO:** `INSERT INTO tablename VALUES (v1, v2, ...);` inserts a record. If inserting values for only some attributes, the syntax `INSERT INTO tablename (col1, col2) VALUES (v1, v2);` must be used. Text and date values must be enclosed in single quotes. When a foreign key table is being populated, the referenced table must already have the corresponding record. (NCERT §8.5.1, p. 153–156)
- **DQL — SELECT statement:** `SELECT attr1, attr2 FROM tablename WHERE condition;` retrieves data. `SELECT *` retrieves all columns. The WHERE clause is optional and filters rows. The AS keyword renames a column in the output (alias). Arithmetic expressions like `Salary*12` can appear in SELECT. Aliases with spaces must be enclosed in single quotes. (NCERT §8.6, §8.6.1, p. 156–159)
- **DQL — DISTINCT:** `SELECT DISTINCT col FROM table;` removes duplicate values from output. (NCERT §8.6.2(C), p. 160)
- **DQL — WHERE clause operators:** Relational operators `=, <, <=, >, >=, !=;` logical operators AND, OR, NOT; range operator `BETWEEN val1 AND val2` (inclusive of both boundary values); membership operator `IN (v1, v2, ...)` (checks if value belongs to a set); `NOT IN` excludes specified values. (NCERT §8.6.2(D)(E), p. 160–163)
- **DQL — ORDER BY:** `ORDER BY column` sorts output in ascending order by default. `ORDER BY column DESC` sorts in descending order. Multiple columns can be specified. (NCERT §8.6.2(F), p. 163)
- **DQL — NULL handling:** NULL represents a missing or unknown value; it is different from 0. Any arithmetic on NULL yields NULL (e.g., `5 + NULL = NULL`). To filter NULL values: `WHERE column IS NULL` or `WHERE column IS NOT NULL`. The `= NULL` operator does NOT work for NULL checks. (NCERT §8.6.2(G), p. 164)
- **DQL — LIKE operator:** Used with WHERE for substring/pattern matching. Two wildcards: `%` (percent) — represents zero, one or multiple characters; `_` (underscore) — represents exactly one character. Example: `LIKE 'K%'` finds names starting with K; `LIKE '%a'` finds names ending with 'a'; `LIKE '_ANYA'` finds 5-character names where last 4 are 'ANYA'. (NCERT §8.6.2(H), p. 165–166)
- **DML — UPDATE:** `UPDATE tablename SET attr1=val1, attr2=val2 WHERE condition;` modifies existing records. Omitting WHERE updates all rows — a common error to avoid. (NCERT §8.7.1, p. 166–167)
- **DML — DELETE:** `DELETE FROM tablename WHERE condition;` deletes matching records. Without WHERE, all records in the table are deleted. Unlike DROP TABLE, the table structure itself is preserved. (NCERT §8.7.2, p. 167–168)

## 2.2 Definitions to memorise

Term	Definition	Page
SQL	Structured Query Language; standard query language for RDBMS; case-insensitive	144
DDL	Data Definition Language; SQL commands for creating, modifying and deleting relation schemas (CREATE, ALTER, DROP)	146
DML	Data Manipulation Language; SQL commands for inserting, updating and deleting records (INSERT, UPDATE, DELETE)	153
CHAR(n)	Fixed-length string type of length n (0–255); unused positions padded with spaces	145
VARCHAR(n)	Variable-length string type; maximum n characters (0–65535); stores only actual characters	145
INT	Integer data type; 4 bytes; range –2,147,483,648 to 2,147,483,647	146
FLOAT	Numeric type holding decimal values; 4 bytes	146
DATE	Date type stored as 'YYYY-MM-DD'; range 1000-01-01 to 9999-12-31	146
NOT NULL	Constraint ensuring a column cannot have NULL (missing/unknown) values	146
UNIQUE	Constraint ensuring all values in a column are distinct	146
DEFAULT	Constraint specifying a pre-set value used when no value is provided for the column	146
PRIMARY KEY	Constraint uniquely identifying each row in a table; implies NOT NULL + UNIQUE	146
FOREIGN KEY	Constraint referencing the primary key of another (referenced) table	146
Composite Primary Key	Primary key made up of two or more attributes together	148
DESCRIBE / DESC	SQL statement that displays the structure of a table	149
NULL	Special SQL value representing missing or unknown data; distinct from 0 or empty string	164
BETWEEN	Operator checking if a value falls within an inclusive range	162
IN	Membership operator checking if a value matches any value in a given list	162
LIKE	Operator used with WHERE for pattern matching; uses % and _ wildcards	165
ORDER BY		163

Term	Definition	Page
	Clause that sorts query results by one or more columns; default is ascending	
DISTINCT	Clause that eliminates duplicate rows from SELECT output	160
Alias (AS)	Temporary column name assigned in the SELECT output using AS keyword	158
CREATE DATABASE	DDL command that creates a new database	146
USE	Selects the active database for subsequent commands	147
SHOW TABLES	Lists all tables in the active database	147
CREATE TABLE	DDL command that defines a new relation with attributes and constraints	147
ALTER TABLE	DDL command that modifies the structure of an existing table	149
DROP TABLE	DDL command that permanently removes a table and its data	153
DROP DATABASE	DDL command removing an entire database including all tables	153
INSERT INTO	DML command that inserts records into a table	153
UPDATE	DML command that modifies existing records based on a WHERE clause	166
DELETE	DML command that removes matching records but preserves table structure	167
Wildcard %	LIKE wildcard matching zero or more characters	165
Wildcard _	LIKE wildcard matching exactly one character	165
IS NULL	Predicate used to test if a column value is NULL	164
BIGINT	8-byte integer data type used when INT range is insufficient	146

## 2.3 Diagrams / processes to remember

- **Figure 8.1 — MySQL Shell:** Screenshot of the MySQL 5.7 command-line client showing the `mysql>` prompt. Students should recognise what the prompt signifies (MySQL is ready for SQL input). (p. 145)
- **Table 8.1 — Commonly used data types in MySQL:** The five data types (CHAR, VARCHAR, INT, FLOAT, DATE) with storage size and range. This table is frequently referenced in MCQs asking which data type is appropriate for a given attribute. (p. 145–146)
- **Table 8.2 — Commonly used SQL Constraints:** Five constraints with descriptions. The "which two constraints together produce a Primary Key effect" question (NOT NULL + UNIQUE) is a classic CUET trap. (p. 146)

- **Tables 8.3–8.5 — Data types and constraints for STUDENT, GUARDIAN, ATTENDANCE:** Real schema examples showing how data type and constraint decisions are made attribute by attribute; referencing table and referenced table concepts for foreign key. (p. 148)
- **INSERT order dependency:** When inserting data into tables with foreign key relationships, the referenced table must be populated first (GUARDIAN before STUDENT, STUDENT before ATTENDANCE). (p. 153–154)

## 2.4 Common confusions / NTA trap points

- **CHAR vs VARCHAR for fixed-length data:** A phone number or Aadhaar number is stored as CHAR, not INT — because no arithmetic is performed on it and its length is fixed. NTA may present an attribute and ask the correct data type; choosing INT for a phone number is a common wrong answer.
- **NULL is not zero:** Any arithmetic involving NULL returns NULL. To filter NULL values, `IS NULL` must be used — writing `= NULL` is incorrect and returns no results. NTA sometimes presents `WHERE Bonus = NULL` as a plausible option.
- **PRIMARY KEY vs NOT NULL + UNIQUE:** PRIMARY KEY implicitly enforces both NOT NULL and UNIQUE, but NOT NULL + UNIQUE alone does not automatically create a PRIMARY KEY designation. Students often confuse these in "which combination equals primary key" assertion–reason questions.
- **DROP vs DELETE vs ALTER ... DROP:** DROP TABLE removes the entire table structure and data permanently. DELETE removes records but preserves the table structure. ALTER TABLE ... DROP removes a single attribute from the table structure. NTA presents these as distractors in "what does the statement do" questions.
- **ORDER BY default order (NCERT § 8.6.2(F), p. 163).** ORDER BY sorts in ascending order by default. DESC must be explicitly written for descending order.
- **BETWEEN is inclusive (NCERT § 8.6.2(D), p. 162).** `WHERE Marks BETWEEN 50 AND 60` includes both 50 and 60. NTA distractor: claims exclusion at boundaries.
- **SQL is case-insensitive in keywords but case-sensitive in data (NCERT § 8.2.1, p. 144).** `SELECT` and `select` are the same; but `'akansha'` and `'Akansha'` may match differently depending on collation.
- **DELETE preserves the table (NCERT § 8.7.2, p. 167-168).** DROP removes the table itself.
- **Foreign key insertion order (NCERT § 8.5.1, p. 153-154).** Insert the referenced table first; otherwise the FK constraint fails.
- **Date format is 'YYYY-MM-DD' (NCERT § 8.3.1, p. 146).** NTA may suggest 'DD-MM-YYYY' as a plausible option — it is wrong.
- `SELECT *` **retrieves all columns (NCERT § 8.6, p. 157).** A star always means "all attributes" in SQL.

## Practice MCQs

**Q1. Which of the following statements is correct about CHAR(10) and VARCHAR(10) data types in MySQL?**

- A. Both always occupy exactly 10 bytes of storage.
- B. CHAR(10) always occupies 10 characters of storage, while VARCHAR(10) occupies only the actual number of characters stored.
- C. VARCHAR(10) always occupies 10 characters of storage, while CHAR(10) occupies only the actual number of characters stored.
- D. Both data types hold a maximum of 255 characters.

**Q2. Consider the following SQL statement: `` ALTER TABLE GUARDIAN ADD UNIQUE (GPhone); `` What is the effect of executing this statement?**

- A. It removes the GPhone attribute from the GUARDIAN table.
- B. It adds a new column GPhone to the GUARDIAN table.
- C. It ensures that no two rows in GUARDIAN can have the same GPhone value.
- D. It changes the data type of GPhone to a unique integer type.

**Q3. Match the following SQL commands with their correct functions: | Command | Function | |---|---| | P. INSERT INTO | 1. Permanently removes a table from the database | | Q. DROP TABLE | 2. Adds new records to a table | | R. UPDATE | 3. Displays the structure of a table | | S. DESC | 4. Modifies existing data in a table |**

- A. P-2, Q-1, R-4, S-3
- B. P-2, Q-3, R-1, S-4
- C. P-4, Q-1, R-2, S-3
- D. P-2, Q-1, R-3, S-4

 **12 more MCQs + answer key**

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## PYQ Alignment

Chapter 8 is one of the highest-yield chapters for CUET Computer Science, consistently appearing as 4–6 direct questions per year; NTA particularly favours SQL syntax correctness questions (which clause to use, correct operator for NULL or pattern matching), data-type selection for given attributes, and short code-trace questions asking what the output of a SELECT or the effect of an ALTER statement will be. See [PYQ archive for Computer Science](#).

