

DAY-17

DATA TYPES IN SQL



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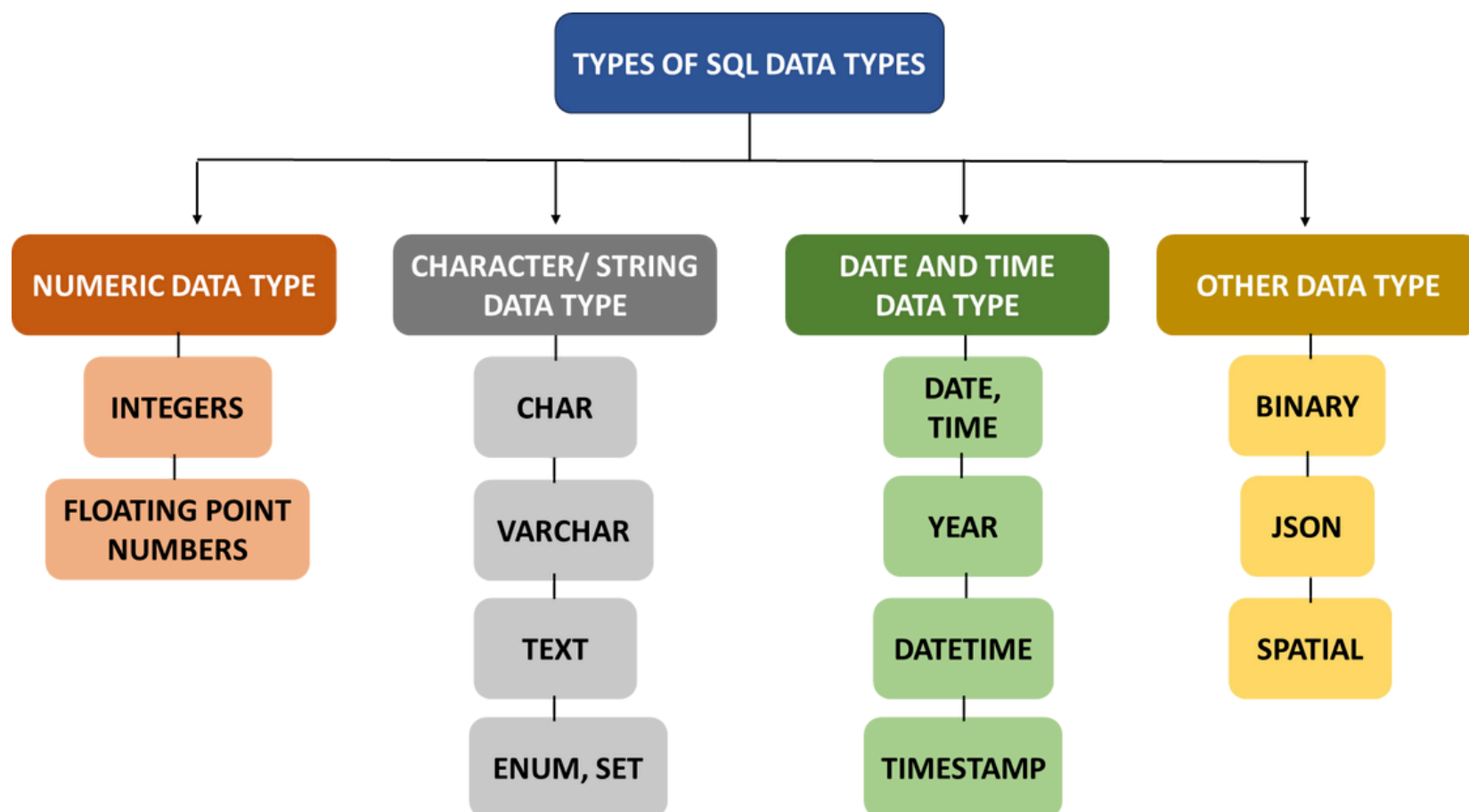


What are Data Types ?

- In SQL (Structured Query Language), data types define the type of data that can be stored in a particular column or variable.
- They tell the database how to interpret the values being stored, ensuring that only valid data is entered into the table's columns



TYPES OF DATA TYPES





(1.) NUMERIC DATA TYPES

- They are further categorized into two main parts.

1.) Integers

2.) Floating Point Numbers

- Each part has a distinct purpose and offers various options designed to meet specific use cases and requirements.



(a.) INTEGERS

- Stores whole numbers without decimal points.
- It includes negative numbers too.
- For example: 5, -89, 2501

(b.) FLOATING POINT NUMBERS

- The float data types are used to store positive and negative numbers with a decimal point, like 35.3, -2.34, or 3597.34987.



TYPES OF INTEGERS

- They are further sub categorized and each of them serve different little purpose.

1. TINYINT

2. SMALLINT

3. MEDIUMINT

4. INT

5. BIGINT



TYPES OF INTEGERS

- For detailed specifications, refer to the following table:

Type	Storage (Bytes)	Minimum Value Signed	Minimum Value Unsigned	Maximum Value Signed	Maximum Value Unsigned
TINYINT	1	-128	0	127	255
SMALLINT	2	-32768	0	32767	65535
MEDIUMINT	3	-8388608	0	8388607	16777215
INT	4	-2147483648	0	2147483647	4294967295
BIGINT	8	-2^{63}	0	$2^{63} - 1$	$2^{64} - 1$



TYPES OF FLOATING POINT NUMBERS

- **Floating-point data types** are used to store approximate numeric values that have decimal points.
- It includes Float, Double, and Decimal.

(a.) FLOAT

- Stores floating-point numbers with approximate precision.
- Usage: Scientific data like distances, measurements.
- Storage: 4 bytes
- Precision: Approximately 7 decimal digits



TYPES OF FLOATING POINT NUMBERS

(b.) DOUBLE

- **DOUBLE** can store both extremely large and very small numbers with high precision
- **Storage:** 8 bytes
- **Precision:** Approximately 15 decimal digits

(c.) DECIMAL

- Stores fixed-point decimal numbers with exact precision.
- For Example: `DECIMAL(10, 2)` 15648753.21
- The number has a total of 10 digits, with 2 digits after the decimal point).



(2.) CHARACTER/STRING DATA TYPES

- **String data types** are used to store text-based information
- . These data types are crucial for storing names, addresses, descriptions, and any other type of string data.
- SQL provides various types of string data types to handle different needs, including fixed-length, variable-length, large text, and even non-standard characters.



TYPES OF STRING/ CHARACTER DATA TYPES

(a.) CHAR

- CHAR is used for storing fixed-length strings.
- If the string is shorter than the defined length, it is padded with spaces to fit the defined length.
- **Usage:** Used for fixed-size values like country codes (e.g., "USA", "IND")

(b.) VARCHAR

- VARCHAR is used for storing variable-length strings.
- Unlike CHAR, it does not pad the data with extra spaces, meaning only the actual characters are stored, reducing wasted space.
- **Usage:** Flexible for storing names, addresses, descriptions.



TYPES OF STRING/ CHARACTER DATA TYPES

(c.) TEXT

- TEXT is designed to store very large amounts of text, such as long articles, comments, or detailed product descriptions
- It can store strings much larger than VARCHAR.
- **Usage:** Articles, comments, descriptions where the length can exceed the limits of VARCHAR.

(d.) ENUM

- Stores a predefined list of values.
- Example: ENUM('Small', 'Medium', 'Large')
- **Usage:** Used for selecting one value from a list (like T-shirt sizes).



TYPES OF STRING/ CHARACTER DATA TYPES

(e.) SET

- Stores a set of values. Multiple values can be stored from a predefined list.
- Example: SET('Red', 'Green', 'Blue')
- **Usage:** Stores multiple options like tags.



(3.) DATE AND TIME DATA TYPES

- SQL provides several date and time data types to store date, time, and datetime information.
- These data types allow you to store, manipulate, and query time-based data effectively
- It includes following: DATE, TIME , DATETIME, TIMESTAMP, YEAR



TYPES OF DATE AND TIME DATA TYPES

(a.) DATE

- DATE stores a calendar date without a time component.
- It consists of year, month, and day.
- **Format:** YYYY-MM-DD
- Use DATE when you only need to store a specific day, such as a birthdate, hire date, or event date, without considering time.



TYPES OF DATE AND TIME DATA TYPES

(b.) TIME

- TIME stores a time of day without a date component.
- It includes hours, minutes, and seconds .
- **Format:** HH:MM:SS
- Use TIME when you need to store the specific time of day without the need for a date such as opening hours, meeting start times, or shift start times.



TYPES OF DATE AND TIME DATA TYPES

(c.) DATETIME

- DATETIME stores both date and time. It includes year, month, day, hours, minutes, and seconds.
- **Format:** YYYY-MM-DD HH:MM:SS
- Combines the DATE and TIME formats into a single value.
- Use DATETIME when you need to store both the date and the exact time for events like logging user actions, storing orders



TYPES OF DATE AND TIME DATA TYPES

(d.) TIMESTAMP

- **TIMESTAMP** is similar to **DATETIME** but with additional time zone awareness.
- It records both the date and time, and it is typically stored in UTC (Coordinated Universal Time).
- When queried, it can be converted to the local time zone if needed.
- **Format:** YYYY-MM-DD HH:MM:SS
- For example, 2024-09-21 14:30:00 in UTC.



TYPES OF DATE AND TIME DATA TYPES

(e.) YEAR

- YEAR is used to store just the year. Depending on the database system, it can either store 2-digit or 4-digit years.
- **Format:**
- 2-digit: Represents years from 1970 to 2069 (i.e., 70 = 1970, 69 = 2069).
- 4-digit: Stores years as full 4-digit numbers.
- Use YEAR when you only need to store the year, such as for manufacturing dates, product launch years, or academic year records.



(4.) OTHER DATA TYPES

- In addition to the common date, time, numeric, and string data types, many database systems offer additional specialized data types to handle specific types of data.
- It includes following: Binary data types, Spatial data types and Json data types.



TYPES OF OTHER DATA TYPES

(a.) BINARY DATA TYPES

- These are used to store binary data (files, images, etc.).
- **For example :** VARBINARY (variable length binary data) and BLOB (Binary Large Object used for storing large binary files.)



TYPES OF OTHER DATA TYPES

(b.) SPATIAL DATA TYPES

- These types are specific to geographic data. It includes the following:

(a.) GEOMETRY

- Stores data for spatial features (points, lines, polygons) and used in Geographic Information Systems (GIS)

(b.) POINT

- Stores a single location in space (a pair of latitude and longitude coordinates).

(c.) POLYGON

- Stores a polygon shape (a series of points that create a closed shape).



TYPES OF OTHER DATA TYPES

(c.) JSON DATA TYPES

- JSON is a lightweight data interchange format used for representing structured data in a readable text format.
- It represents data in the form of key-value pairs and supports:
- **Objects:** Containing key-value pairs ({"name": "John", "age": 30})
- **Arrays:** Ordered lists of values (["apple", "banana", "cherry"])



APPLICATIONS OF DATA TYPES

- **Data integrity and validation:** Prevents invalid data from being inserted.
- **Efficient storage:** Minimizes storage space by using appropriate data types.
- **Performance optimization:** Enables faster queries and efficient indexing.
- **Data manipulation:** Facilitates calculations, comparisons, and manipulations.



APPLICATIONS OF DATA TYPES

- **Consistency:** Ensures that data follows a specific format and structure.
- **Security and control:** Limits data input and enforces constraints.
- **Flexibility:** Supports schema-less and semi-structured data like JSON.
- **Complex queries:** Enables time-based and numeric data analysis.

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