

Module 2 - Data Types in SQL

What are Data Types in SQL?

In SQL, data types define the kind of data you can store in a column of a table.

In SQL (Structured Query Language), when you create a table to store data, each column in the table is meant to hold a specific type of data.

For example:

- One column might store names (which are words or text),
- Another might store age (which is a number),
- Another might store the date someone joined (which is a date).

To make sure the right kind of data is stored in each column, SQL uses data types.

When you create a table in SQL, you're making a place to store information (data) in rows and columns – just like an Excel sheet.

Each column in that table stores one kind of thing – like names, ages, dates, prices, etc.

But here's the important part:

SQL needs to know what kind of data you're going to store in each column.

That "kind" is called a data type.

Main use of Data Types in SQL?

When you create a table in SQL, each column stores a specific kind of data, such as names, ages, dates, or prices. To keep the data correct and organized, SQL uses data types.

A data type tells SQL what kind of data is allowed in a column. For example, one column may allow only numbers, another may allow only text, and another only dates.



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Why Are Data Types Important?

1. Ensures the Right Kind of Data is Stored

Data types prevent mistakes by only allowing the correct kind of data.

Example:

If a column is for age (a number), SQL won't allow you to enter text like "sixteen". It will only accept numbers like 16.

2. Saves Storage Space

Different types of data use different amounts of memory.

Example:

Text uses more space than numbers. By using the right data type, you save space in the database.

3. Improves Speed and Performance

When SQL knows the type of data, it can perform searches, sorts, and calculations more quickly and efficiently.

Example:

Finding all people older than 18 is faster when age is stored as a number instead of text.

4. Helps with Sorting and Filtering

If data is stored in the correct type, it can be sorted and filtered correctly.

Example:

Dates stored as actual dates can be sorted from oldest to newest. If dates are stored as plain text, the sorting might be incorrect.

5. Allows Calculations

Only numeric data types allow calculations like addition, subtraction, and averages.

Example:

You can total up the fees paid if the column is a number. You cannot do that if it's stored as text.

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6. Reduces Errors

Data types stop incorrect data from being entered. If you try to store the wrong type of data, SQL gives an error message.

Example:
Trying to put a word in a number column will not be accepted.

Main Categories of SQL Data Types

1. Numeric Data Types (for numbers)

These data types are used to store numbers. Some are used for whole numbers, while others can store numbers with decimal points.

Data Type	Description
INT or INTEGER	Whole numbers (e.g., 1, 25, -10)
SMALLINT	Smaller whole numbers (uses less memory than INT)
BIGINT	Very large whole numbers
DECIMAL(p, s) or NUMERIC(p, s)	Exact numbers with decimal points. p is total digits, s is digits after the decimal point. Example: DECIMAL(5,2) means a number like 999.99
FLOAT	Approximate decimal numbers (not completely exact)
REAL	Similar to FLOAT, but with less precision

2. Character/String Data Types (for text)

These store letters, numbers, and other characters.

Data Type	Description
CHAR(n)	Fixed-length text. If you store less than n characters, it fills with spaces. Example: CHAR(5) stores "Hi" as "Hi "
VARCHAR(n)	Variable-length text, up to n characters. Example: VARCHAR(100)
TEXT	Long text strings. Used for paragraphs, articles, etc. (size limit depends on DBMS)

3. Date and Time Data Types

Used to store dates, times, or both.

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Concepts of SQL

Data Type	Description
DATE	Stores only the date (e.g., 2025-06-05)
TIME	Stores only the time (e.g., 14:30:00)
DATETIME	Stores both date and time (e.g., 2025-06-05 14:30:00)
TIMESTAMP	Stores date and time, often with time zone info. Used for tracking changes.
YEAR	Stores just the year (e.g., 2025). Mostly used in MySQL

4. Boolean Data Type
Stores truth or false values.

Data Type	Description
BOOLEAN	Stores TRUE, FALSE, or NULL

5. Binary Data Types

Used to store binary (raw) data like files, images, etc.

Data Type	Description
BINARY(n)	Fixed-length binary data
VARBINARY(n)	Variable-length binary data
BLOB	Binary Large Object. Used for storing large files or images

6. Other Data Types:

Data type	Description
Memo	Memo is used for larger amounts of text. Stores up to 65,536 characters. Note: You cannot sort a memo field. However, they are searchable
Byte	Allows whole numbers from 0 to 255
Long	Allows whole numbers between -2,147,483,648 and 2,147,483,647
Single	Single precision floating-point. Will handle most decimals
Double	Double precision floating-point. Will handle most decimals
Currency	Use for currency. Holds up to 15 digits of whole dollars, plus 4 decimal places. Tip: You can choose which country's currency to use
AutoNumber	AutoNumber fields automatically give each record its own number, usually starting at 1