

## SQL Functions

SQL functions are built-in methods used to perform operations on data within a database. They are primarily categorized into aggregate functions and scalar functions, each serving distinct purposes in data manipulation and analysis.

### Aggregate Functions

Aggregate functions operate on multiple rows and return a single summary value. They are commonly used alongside the `GROUP BY` clause to group data and perform calculations on each group<sup>[3][4][1]</sup>. Key aggregate functions include:

Function	Description	Example
<code>COUNT()</code>	Counts rows	<code>SELECT COUNT(*) FROM employees;</code>
<code>SUM()</code>	Adds values	<code>SELECT SUM(salary) FROM employees;</code>
<code>AVG()</code>	Calculates average	<code>SELECT AVG(salary) FROM employees;</code>
<code>MAX()</code>	Finds highest value	<code>SELECT MAX(salary) FROM employees;</code>
<code>MIN()</code>	Finds lowest value	<code>SELECT MIN(salary) FROM employees;</code>

#### Usage Example:

```
SELECT department, COUNT(*) AS total_employees, AVG(salary) AS avg_salary
FROM employees
GROUP BY department;
```

This query returns the number of employees and average salary for each department<sup>[3][4][5]</sup>.

### String Functions

String (or character) functions are a type of scalar function used to manipulate and transform text data. Common examples include:

Function	Description	Example
<code>UPPER()</code>	Converts to uppercase	<code>SELECT UPPER(name) FROM employees;</code>
<code>LOWER()</code>	Converts to lowercase	<code>SELECT LOWER(name) FROM employees;</code>

LENGTH()	Returns string length	SELECT LENGTH(name) FROM employees;
CONCAT()	Combines strings	SELECT CONCAT(first_name, ' ', last_name) FROM employees;

Date Functions

Date functions allow you to work with and manipulate date and time values. Examples include:

Function	Description	Example
NOW()	Current date and time	SELECT NOW();
CURDATE()	Current date	SELECT CURDATE();
DATEDIFF()	Days between dates	SELECT DATEDIFF('2025-06-01', '2025-05-01');
YEAR()	Extracts year	SELECT YEAR(hire_date) FROM employees;

Mathematical Functions

Mathematical functions perform calculations on numeric data. Common ones include:

Function	Description	Example
ROUND()	Rounds number	SELECT ROUND(123.456, 2);
FLOOR()	Largest integer ≤ value	SELECT FLOOR(123.456);
CEIL()	Smallest integer ≥ value	SELECT CEIL(123.456);
ABS()	Absolute value	SELECT ABS(-10);

Summary Table: Aggregate vs. Scalar Functions

Feature	Aggregate Functions	Scalar Functions
Operate on	Multiple rows	Single value
Return	Single summary value	Single value
Examples	COUNT, SUM, AVG, MIN, MAX	UPPER, LOWER, ROUND, LENGTH
Usage	Often with GROUP BY	On individual columns

Aggregate functions are essential for summarizing and analyzing data sets, while scalar functions (including string, date, and mathematical functions) are used for manipulating individual data values.