


# SQL Cheat Sheet



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## SQL Commands, Functions & Clauses

-- Basic SQL commands:

**SELECT** - retrieves data from a database  
**FROM** - specifies which tables to retrieve data from  
**WHERE** - specifies which rows to retrieve based on certain conditions  
**GROUP BY** - groups rows that have the same values in the specified columns  
**HAVING** - filters groups based on a specified condition  
**ORDER BY** - sorts the retrieved rows in a specified order

-- Aggregate functions:

**AVG()** - returns the average value of a set of values  
**COUNT()** - returns the number of rows in a table or the number of non-null values in a column  
**FIRST()** - returns the first value in a set of values  
**LAST()** - returns the last value in a set of values  
**MAX()** - returns the maximum value in a set of values  
**MIN()** - returns the minimum value in a set of values  
**SUM()** - returns the sum of a set of values

-- String functions:

**CONCAT()** - concatenates two or more strings together  
**INSTR()** - returns the position of a substring within a string  
**LENGTH()** - returns the length of a string  
**LOWER()** - converts a string to lowercase  
**LTRIM()** - removes leading spaces from a string  
**REPLACE()** - replaces all occurrences of a specified string with another string  
**RTRIM()** - removes trailing spaces from a string  
**SUBSTR()** - returns a portion of a string  
**TRIM()** - removes leading and trailing spaces from a string  
**UPPER()** - converts a string to uppercase

-- Date functions:

**CURDATE()** - returns the current date  
**CURTIME()** - returns the current time  
**DATE()** - extracts the date portion from a date/time value  
**DATEADD()** - adds a specified time interval to a date  
**DATEDIFF()** - returns the difference between two dates  
**DATEPART()** - extracts a specified part of a date/time value  
**DAY()** - returns the day of the month for a date value  
**MONTH()** - returns the month for a date value  
**NOW()** - returns the current date and time  
**YEAR()** - returns the year for a date value

-- Other functions:

**COALESCE()** - returns the first non-null value in a list of values  
**IFNULL()** - returns a specified value if a value is null  
**NULLIF()** - returns null if two values are equal

-- Joins:

**INNER JOIN** - returns rows that have matching values in both tables  
**OUTER JOIN** - returns rows that have matching values in either of the two tables  
**LEFT JOIN** - returns all rows from the left table and any matching rows from the right table  
**RIGHT JOIN** - returns all rows from the right table and any matching rows from the left table  
**FULL JOIN** - returns all rows from both tables, whether or not there are matching values  
**CROSS JOIN** - returns all rows from both tables, with each row from the first table being paired with each row from the second table

-- Set operations:

**UNION** - combines the results of two or more SELECT statements, eliminating duplicates  
**UNION ALL** - combines the results of two or more SELECT statements, including duplicates  
**INTERSECT** - returns rows that are present in the results of two or more SELECT statements  
**EXCEPT** - returns rows that are present in the first SELECT statement but not in the results of any subsequent SELECT statements

-- Subqueries:

**SELECT** - retrieves data from a database within another SELECT statement  
**FROM** - specifies which tables to retrieve data from within the subquery  
**WHERE** - specifies which rows to retrieve based on certain conditions within the subquery  
**GROUP BY** - groups rows that have the same values in the specified columns within the subquery  
**HAVING** - filters groups based on a specified condition within the subquery

-- Data manipulation commands:

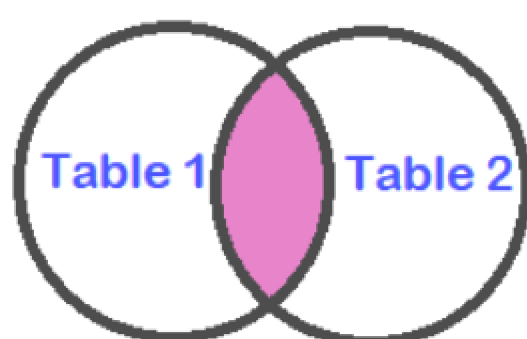
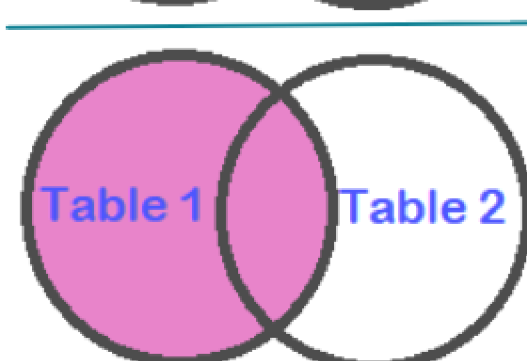
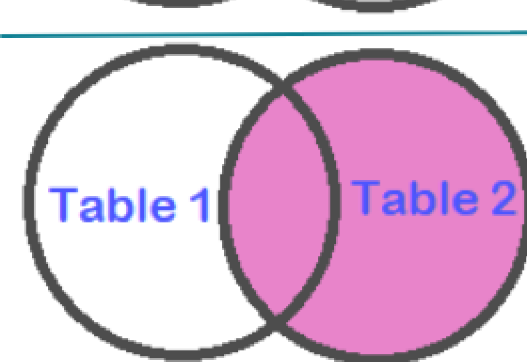
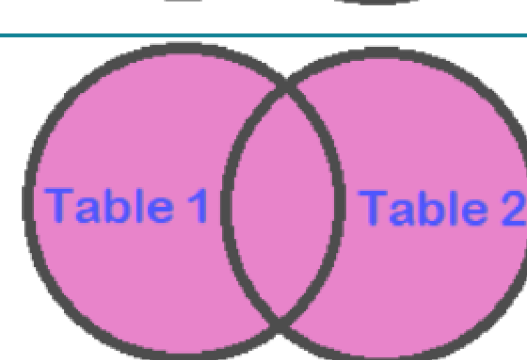
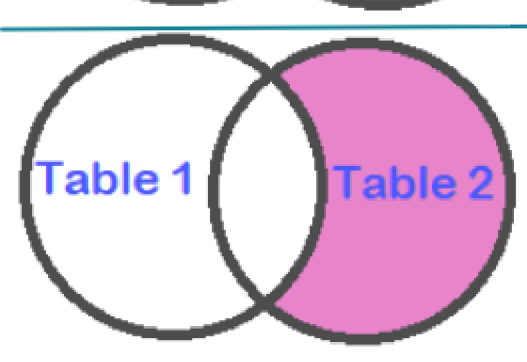
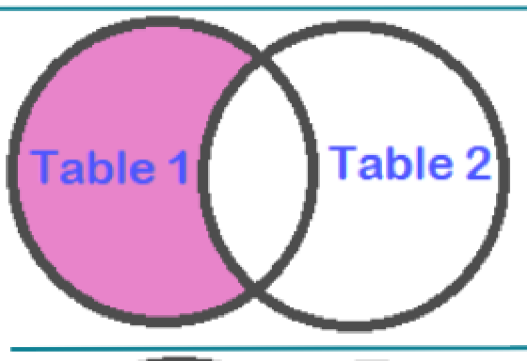
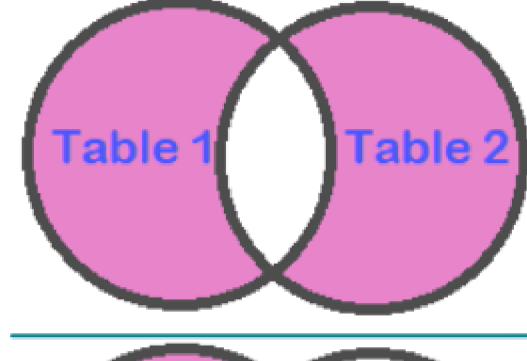
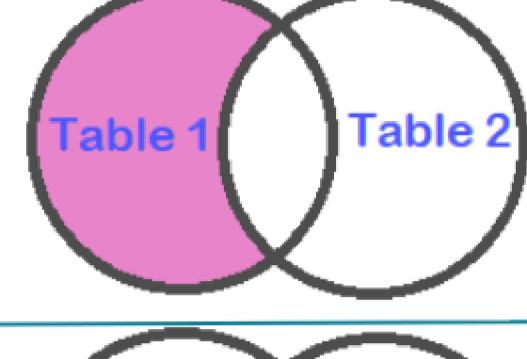

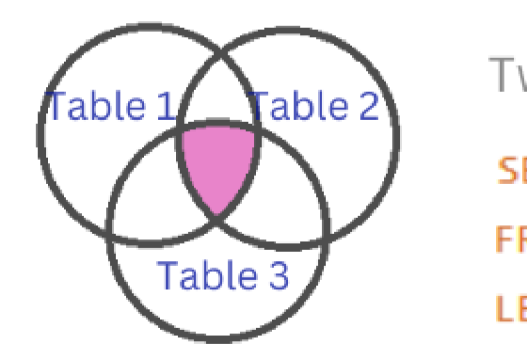
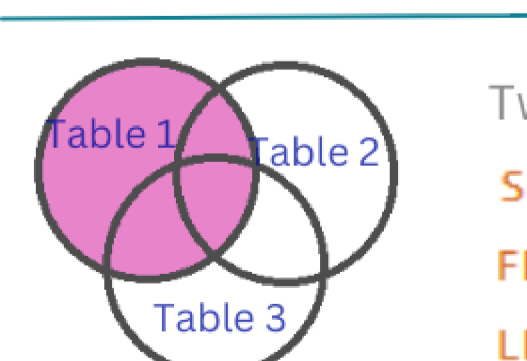
**INSERT INTO** - adds a new row to a table  
**UPDATE** - modifies existing data in a table  
**DELETE** - removes existing rows from a table  
**TRUNCATE TABLE** - removes all rows from a table

-- Data definition commands:

**CREATE TABLE** - creates a new table  
**ALTER TABLE** - modifies the structure of an existing table  
**DROP TABLE** - deletes a table  
**TRUNCATE TABLE** - removes all rows from a table  
**CREATE INDEX** - creates an index on a table to improve search performance  
**DROP INDEX** - deletes an index from a table

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	<p>-- INNER JOIN:</p> <pre>SELECT * FROM table1 INNER JOIN table2 ON table1.col1 = table2.col2</pre>	<p>-- NATURAL JOIN:</p> <pre>SELECT * FROM table1 NATURAL JOIN table2;</pre>
	<p>Outer Join</p> <p>-- LEFT JOIN:</p> <pre>SELECT * FROM table1 LEFT JOIN table2 ON table1.col1 = table2.col2</pre>	<p>This type of join automatically matches rows from both tables based on their common columns. The common columns must have the same name and data type in both tables.</p>
	<p>Outer Join</p> <p>-- RIGHT JOIN:</p> <pre>SELECT * FROM table1 RIGHT JOIN table2 ON table1.col1 = table2.col2</pre>	<p>-- OUTER APPLY:</p> <pre>SELECT t1.*, t2.* FROM table1 t1 OUTER APPLY table_valued_function(t1.col1) t2;</pre>
	<p>-- FULL OUTER JOIN:</p> <pre>SELECT * FROM table1 FULL OUTER JOIN table2 ON table1.col1 = table2.col2</pre>	<p>This type of join is similar to CROSS APPLY, but it returns all rows from the left table, even if there are no matching rows in the right table.</p>
	<p>Right Outer Join with Exclusion</p> <pre>SELECT * FROM table1 RIGHT JOIN table2 ON table1.col1 = table2.col2 WHERE table1.col1 IS NULL;</pre>	<p>-- CROSS JOIN:</p> <pre>SELECT * FROM table1 CROSS JOIN table2 CROSS JOIN table3;</pre>
	<p>Left Outer Join with Exclusion</p> <pre>SELECT * FROM table1 LEFT JOIN table2 ON table1.col1 = table2.col2 WHERE table2.col1 IS NULL;</pre>	<p>This type of join allows you to apply a table-valued function to each row in a table and join the results to the input rows.</p>
	<p>Full Outer Join with Exclusion</p> <pre>SELECT * FROM table1 FULL OUTER JOIN table2 ON table1.col1 = table2.col2 WHERE table1.col1 IS NULL OR table2.col1 IS NULL;</pre>	<p>-- SELF JOIN:</p> <pre>SELECT t1.col1, t2.col2 FROM table1 t1 INNER JOIN table1 t2 ON t1.col3 = t2.col4;</pre>
	<p>Anti Semi Join</p> <pre>SELECT * FROM table1 WHERE NOT EXISTS (SELECT 1 FROM table2 WHERE table1.col1 = table2.col2);</pre>	<p>Returns all rows from the left table that do not have a match in the right table. Similar to a LEFT JOIN, but it only returns the rows from the left table that do not have a match in the right table.</p>
	<p>Semi Join ( Less duplication than Inner Join)</p> <pre>SELECT * FROM table1 WHERE EXISTS (SELECT 1 FROM table2 WHERE table1.col1 = table2.col2);</pre>	<p>Returns only the rows from the left table that have a match in the right table. Similar to an INNER JOIN, but it only returns the rows from the left table that have a match in the right table, rather than returning all rows from both.</p>
	<p>Two Inner Joins</p> <pre>SELECT * FROM table1 INNER JOIN table2 ON table1.col1 = table2.col2 LEFT JOIN table3 ON table2.col3 = table3.col4;</pre>	<p>This query will return rows from all three tables that have matching values in the joined columns. It will first join table1 and table2 based on the values in the col1 and col2 columns</p>
	<p>Two Left Outer Joins</p> <pre>SELECT * FROM table1 LEFT JOIN table2 ON table1.col1 = table2.col2 LEFT JOIN table3 ON table2.col3 = table3.col4;</pre>	<p>It returns all rows from the leftmost table, as well as any matching rows from the other two tables. Rows from the other two tables that do not have a match in the leftmost table are NULL.</p>



## SQL Examples (Easy to Advanced)

-- Sample data for the "employees" table:

id	name	department	salary	hired_on
1	Alice	HR	55000	2020-01-01
2	Bob	Marketing	65000	2020-02-01
3	Charlie	IT	75000	2020-03-01
4	Dave	Sales	80000	2020-04-01
5	Eve	HR	60000	2020-05-01

-- Sample data for the "sales" table:

id	employee_id	product	sale_date	sale_amount
1	1	Widget	2020-06-01	1000
2	1	Gadget	2020-07-01	2000
3	2	Widget	2020-08-01	3000
4	2	Gadget	2020-09-01	4000
5	2	Thingamajig	2020-10-01	5000
6	3	Thingamajig	2020-11-01	6000
7	4	Widget	2020-12-01	7000
8	4	Gadget	2021-01-01	8000
9	4	Thingamajig	2021-02-01	9000
10	5	Widget	2021-03-01	10000

-- Sample data for the "products" table:

id	product	price
1	Widget	100
2	Gadget	200
3	Thingamajig	300

1- Retrieve all rows from the 'employees' table where the salary is greater than 65000.

```
SELECT * FROM employees WHERE salary > 65000;
```

2-Retrieve the name and department of all rows from the 'employees' table, sorted by salary in descending order.

```
SELECT name, department FROM employees ORDER BY salary DESC;
```

3-Retrieve the product and total sales for each product in the 'sales' table, sorted by total sales in descending order.

```
SELECT p.product, SUM(s.sale_amount) as total_sales FROM sales s  
INNER JOIN products p ON s.product = p.product GROUP BY p.product  
ORDER BY total_sales DESC;
```

4-Retrieve the name and total sales for all employees in the Marketing department from the 'employees' and 'sales' tables.

```
SELECT e.name, SUM(s.sale_amount) as total_sales FROM employees e  
INNER JOIN sales s ON e.id = s.employee_id WHERE e.department =  
'Marketing' GROUP BY e.name;
```

5-Retrieve the name, product, and sale date for all sales in the sales table where the sale amount is greater than 2500.

```
SELECT e.name, p.product, s.sale_date FROM employees e INNER JOIN  
sales s ON e.id = s.employee_id INNER JOIN products p ON s.product =  
p.product WHERE s.sale_amount > 2500;
```

6-Retrieve the name, product, and sale amount for all sales in the sales table that occurred between June 1, 2020 and December 31, 2020.

```
SELECT e.name, p.product, s.sale_amount FROM employees e INNER JOIN  
sales s ON e.id = s.employee_id INNER JOIN products p ON s.product =  
p.product WHERE s.sale_date BETWEEN '2020-06-01' AND '2020-12-31';
```

7-Retrieve the name, product, and sale amount for the sale with the highest sale amount in the sales table, along with the corresponding employee name from the employees table.

```
SELECT e.name, p.product, s.sale_amount FROM employees e INNER JOIN  
sales s ON e.id = s.employee_id INNER JOIN products p ON s.product =  
p.product WHERE s.sale_amount IN (SELECT MAX(sale_amount) FROM  
sales);
```

8-Retrieve the name and manager of all employees in the employees table, showing the name of the manager from the employees table as well.

```
SELECT e1.name as manager, e2.name as employee FROM employees e1  
INNER JOIN employees e2 ON e1.id = e2.manager_id;
```

9-Retrieve the name and number of employees for all managers in the employees table who have at least one employee.

```
SELECT e.name, (SELECT COUNT(*) FROM employees WHERE manager_id =  
e.id) as num_employees FROM employees e WHERE num_employees > 0;
```

10-Retrieve the name of all employees in the employees table who do not have a manager.

```
SELECT e1.name, e2.name as manager FROM employees e1 LEFT JOIN  
employees e2 ON e1.manager_id = e2.id WHERE e2.name IS NULL;
```

11-Retrieve the name and total sales for all employees in the employees table who have made more than 5000 in sales in the past year (from the current date).

```
SELECT e.name, SUM(s.sale_amount) as total_sales FROM employees e  
INNER JOIN sales s ON e.id = s.employee_id WHERE s.sale_date BETWEEN  
DATEADD(YEAR, -1, GETDATE()) AND GETDATE() GROUP BY e.name HAVING  
SUM(s.sale_amount) > 5000;
```

## Order of Execution

FROM  
WHERE  
GROUP BY  
HAVING  
SELECT  
ORDER BY

This order can be modified by the use of subqueries or common table expressions (CTEs). In these cases, the subquery or CTE is executed first, and the results are used in the outer query.

Here is an example query to show the order of execution:

```
SELECT e.name, SUM(s.sale_amount) as total_sales  
FROM employees e  
INNER JOIN sales s ON e.id = s.employee_id  
WHERE e.department = 'Sales' AND s.sale_date BETWEEN '2020-01-01' AND  
'2020-06-30'  
GROUP BY e.name  
HAVING SUM(s.sale_amount) > 5000  
ORDER BY total_sales DESC;
```

FROM and WHERE clauses are executed first to select the relevant rows from the employees and sales tables. These rows are then grouped by employee name and aggregated using the SUM function in the GROUP BY clause. The HAVING clause filters out any groups that do not meet the specified condition. Finally, the SELECT clause selects the name and total sales for each group, and the ORDER BY clause sorts the results by total sales in descending order.



## Some Advanced Topics in SQL

1-Recursive queries: These are queries that can reference themselves in order to perform a certain action, such as querying hierarchical data.

-- Recursive queries:

```
WITH RECURSIVE cte_name AS (  
    SELECT ...  
    UNION [ALL]  
    SELECT ...  
    FROM cte_name  
    WHERE ...  
)  
SELECT ...  
FROM cte_name;
```

2-Window functions: These are functions that perform a calculation over a set of rows, similar to an aggregate function, but return a value for each row in the result set.

-- Window functions:

```
SELECT col1, col2, function_name(col3) OVER (PARTITION BY col1 ORDER BY  
col2) as col4  
FROM table_name;
```

3-Common table expressions (CTEs): These are named temporary result sets that can be used within a SELECT, INSERT, UPDATE, DELETE, or CREATE VIEW statement. They are often used to simplify complex queries by breaking them up into smaller, more manageable pieces.

-- Common table expressions (CTEs):

```
WITH cte_name AS (  
    SELECT ...  
)  
SELECT ...  
FROM cte_name;
```

4-Pivot tables: These are tables that allow you to transform data from rows to columns, or vice versa, in order to generate more meaningful insights from your data.

-- Pivot tables:

```
SELECT *  
FROM (  
    SELECT col1, col2, col3  
    FROM table_name  
)  
PIVOT (  
    SUM(col3)  
    FOR col2 IN (val1, val2, val3)  
);
```

5-Analytic functions: These are functions that perform a calculation over a group of rows and return a single value for each row in the result set.

-- Analytic functions:

```
SELECT col1, col2, function_name(col3) OVER (PARTITION BY col1 ORDER BY  
col2) as col4  
FROM table_name;
```

6-Triggers: These are pieces of code that are automatically executed in response to certain events, such as inserting, updating, or deleting data in a table.

-- Triggers:

```
CREATE TRIGGER trigger_name  
AFTER INSERT ON table_name  
FOR EACH ROW  
BEGIN  
    -- trigger code here  
END;
```

7--Stored procedures: These are pre-compiled SQL statements that can be stored in the database and executed repeatedly with different parameters.

-- Stored procedures:

```
CREATE PROCEDURE procedure_name (IN param1 datatype, IN param2  
datatype, ...)  
BEGIN  
    -- procedure code here  
END;
```

```
CALL procedure_name(param1_value, param2_value, ...);
```

8-Indexes: These are data structures that are used to improve the performance of certain types of queries by allowing the database to quickly locate the desired data.

-- Indexes:

```
CREATE INDEX index_name ON table_name (col1, col2, ...);  
  
DROP INDEX index_name;
```

9-Cursor-based processing: This is a method of processing data in which a cursor is used to retrieve a small batch of rows from a result set, process the rows, and then retrieve the next batch of rows until all rows have been processed. This can be useful when working with large result sets or when the processing needs to be done row by row.

-- Cursor-based processing:

```
DECLARE cursor_name CURSOR FOR SELECT col1, col2, ... FROM table_name  
WHERE ...;  
  
OPEN cursor_name;  
  
FETCH NEXT FROM cursor_name INTO variable1, variable2, ...;  
  
WHILE @@FETCH_STATUS = 0  
BEGIN  
    -- processing code here  
  
    FETCH NEXT FROM cursor_name INTO variable1, variable2, ...;  
END;  
  
CLOSE cursor_name;  
DEALLOCATE cursor_name;
```



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