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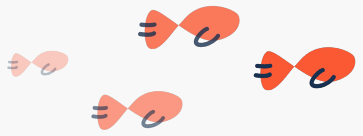
School and Pool for Digital Talent

Introduction to SQL



DDL, DML & DCL

- **Data Definition Language (DDL)** consists of the the commands used to define the database schema by creating, altering or deleting objects
- **Data Manipulation Language (DML)** consists of the commands used to manipulate the data present in the database such as selecting, inserting, updating or deleting records in a database
- **Data Control Language (DCL)** deals with the rights, permissions and other controls of the database system

What can SQL do?

- SQL can execute queries against a database
- SQL can retrieve data from a database
- SQL can insert records in a database
- SQL can update records in a database
- SQL can delete records from a database
- SQL can create new databases
- SQL can create new tables in a database
- SQL can create stored procedures in a database
- SQL can create views in a database
- SQL can set permissions on tables, procedures, and views

https://www.w3schools.com/sql/sql_intro.asp

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Syntax

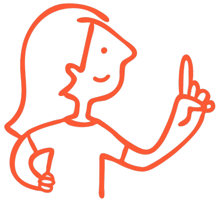
- SQL is structured similar to the English language

  SELECT range
  FROM age_bucket;

- Each table is identified by name

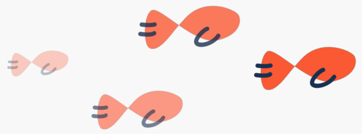
- SQL keywords are NOT case sensitive: select = SELECT

- Important: Some databases allow more than one SQL statement to be executed, therefore it's the standard way to separate each SQL statement with a semicolon



https://www.w3schools.com/sql/sql_syntax.asp

SELECTing Data



SELECT FROM

Select multiple columns

```
SELECT column1,
       column2, ...
FROM table_name;
```

Select all columns

```
SELECT *
FROM table_name;
```

Your first SQL query

Look in the introduction schema

In the new window on the right click on the query under 'Your first SQL query':

```
SELECT range
FROM age_bucket;
```

Now press ^ CTRL □ RETURN and check out the output that was generated below.

Congratulations you just ran your first SQL query!

SELECT DISTINCT

```
SELECT DISTINCT column_names(s)
FROM table_name;
```

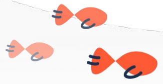
- Columns often contain duplicate values
- DISTINCT returns only distinct (=different) values

LIMIT

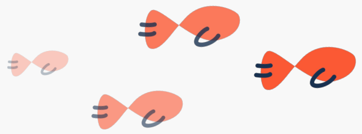
```
SELECT column_names(s)
FROM table_name
LIMIT number;
```

- Databases often contain tables with huge amounts of columns and rows
- By default SQL tries to retrieve all the rows it can find in a table
- The bigger the table, the longer it takes to retrieve its data, therefore always LIMIT your data to only a few rows

DBeaver limits the result to 200 rows by default



Filtering Data



WHERE

```
SELECT column_name(s)
FROM table_name
WHERE condition;
```

- The where clause is used to filter records
- ‘condition’ represents how we want the data to be filtered
- Use quotation marks when filtering string values eg. name = ’female’ for gender table
- Example: Retrieve all days with more than 100 cases

WHERE Operators

Operator	Description
=	Equal
>	Greater than
<	Less than
>=	Greater than or equal
<=	Less than or equal
<> or !=	Not equal
BETWEEN	Between a certain range
LIKE	Search for a pattern
IN	To specify multiple possible values for a column

WHERE with AND, OR, NOT

SELECT column_name(s)
FROM table_name
1. **WHERE** condition1 **AND** condition2 **AND** condition3 ...;
2. **WHERE** condition1 **OR** condition2 **OR** condition3 ...;
3. **WHERE NOT** condition1;

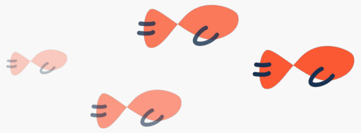
- **AND** displays data if all the conditions separated by **AND** are **TRUE**
- **OR** displays data if any of the conditions separated by **OR** are **TRUE**
- **NOT** displays data if the condition(s) is **NOT TRUE**

WHERE with NULL values

```
SELECT column_name(s)
FROM table_name
WHERE column_name IS NULL | IS NOT NULL
```

- A field that contains a NULL value is a field with no value -> it was left blank during record creation
- Therefore, it’s different from a zero value or a value that contains spaces
- It is not possible to check for NULL values using the WHERE operators (=, <>, >, <) → **Always** use IS NULL to filter for NULL values

Sorting Data

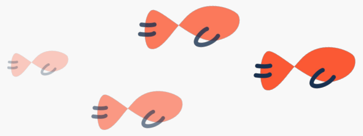


ORDER BY

SELECT column_name(s)
FROM table_name
WHERE condition
ORDER BY column1 **ASC** | **DESC**, column2 **ASC** | **DESC**, ...;

- ORDER BY sorts the results either in ascending or descending order
- By default, results are sorted in ascending order
- When sorting by multiple columns, you can set the sorting order for each column separately
- Columns in the ORDER BY can not only be referenced name but also by their index in the SELECT statement

Aliasing



Aliases for columns and tables

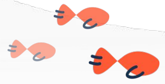
```
SELECT column1 AS alias_name, ...
FROM table_name;

SELECT column_name(s)
FROM table_name AS alias_name;
```

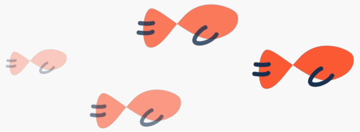
- An alias is created with the AS keyword
- It allows you to give a column or a table a new temporary name within the query
- Use snake case = writing spaces as underscores when creating aliases (arrivaltime -> arrival_time)

When? Whenever possible!
Use cases:

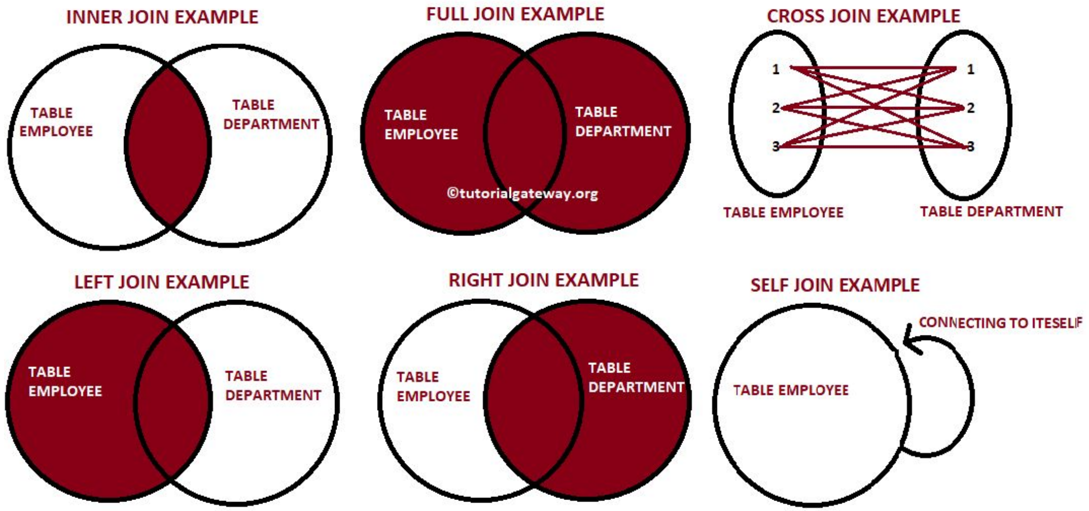
- Column names are long or not very readable
- Aggregate functions are used
- More than one table is involved
- Multiple columns are combined



Selecting from multiple tables



Joining tables



Joining tables

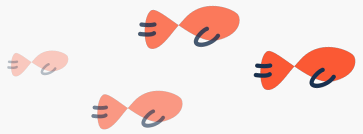
SELECT t1.name, t2.something
FROM table1 t1
INNER JOIN table2 t2 **ON** t1.key1 = t2.key2

inner join is default

now with nice names:

get all cases for women
get all cases for men between 20 and 50

Aggregating Data



MIN() and MAX()

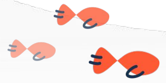
```
SELECT MIN(column1),
       MAX(column2), ...
FROM table_name;
```

- The MIN() function returns the smallest value of the selected column
- The MAX() function returns the largest value of the selected column

AVG(), COUNT() and SUM()

```
SELECT AVG(column1),
       COUNT(column2),
       SUM(column3), ...
FROM table_name;
```

- The AVG() function returns the average value of a numeric column
- The COUNT() function returns the number of non NULL values
- The SUM() function returns the total sum of a numeric column
- DISTINCT can be used inside AVG(), COUNT() and SUM()



Arithmetic Operators

SELECT <expression1><operator><expression2> ...
FROM table_name;

- Arithmetic operators can perform addition, subtraction, multiplication and division on numeric values
- Performing arithmetic calculations is not limited to column names but can be done on single constants, variables or results from other SQL queries

Operator	**Meaning**
+	Addition
-	Subtraction
*	Multiplication
/	Division
%	Modulo

GROUP BY

```
SELECT column_name(s)
FROM table_name
WHERE condition
GROUP BY column_name(s)
ORDER BY column1, column2;
```

- GROUP BY lets you arrange identical data across rows into groups
- In combination with aggregate functions (MIN(), MAX(), AVG(), COUNT(), SUM()) it's used to create summary reports across columns

HAVING

```
SELECT column_name(s)
FROM table_name
WHERE condition
GROUP BY column_name(s)
HAVING condition,
ORDER BY column1, column2;
```

- Aggregate functions can’t be used to filter data inside the WHERE clause, instead use HAVING

- Example: HAVING COUNT(column1) > 5

Documenting Code

SQL Comments

There are two ways of commenting your SQL code

1. Single line comments starting with --
2. Multi-line comments starting with /* and ending with */

Why use comments?

- Reviewing or taking over long and complicated SQL statements is much easier when having proper documentation

- Testing or debugging your code often requires step-by-step execution, where being able to prevent execution of certain SQL statements proves very useful

Overview

Now you know your S-Q-L

CLAUSE	FUNCTION
SELECT	Returns the final data
FROM	Choose tables to get base data
WHERE	Filters the base data
GROUP BY	Aggregates the base data
HAVING	Filters the aggregated data
ORDER BY	Sorts the final data
LIMIT	Limits the returned data to a row count