

Very basic introduction

Databases are organized collections of information or data. They can be non-relational (MongoDB, Oracle NoSQL) or relational (MySQL, Microsoft SQL Server, Oracle Database).

Non-relational databases store data in a non-tabular form and tend to be more flexible than the traditional relational databases. They are often used when large quantities of complex and diverse data needs to be organized. There are 4 major types of NoSQL databases: document databases, key-value databases, wide-column stores, graph databases.

Relational databases is a structure database that contains tables related to each other through keys.

-Primary keys: unique identifiers therefore cannot have duplicates or null values.

-Foreign keys: column in a table that it's the primary key in another table.

This document will focus on relational DB.

Query is a request for data. Nearly all relational databases rely on a version of SQL to query data.

Types of queries:

- DDL (data definition language)
- DQL (data query language)
- DML (data manipulation language)
- DCL (data control language)
- TCL (transaction control language)

Relational Algebra symbols

⊥	null
U	reunion
∩	intersection
*	cartesian product
Π	projection
σ	selection
⋈	junction

Relational Algebra symbols (cont)

⋈ semi-junction

U reunion --> all; ∩ intersection --> middle ones; Π projection --> cuts columns; σ selection --> filters lines; ⋈ junction --> joins tables

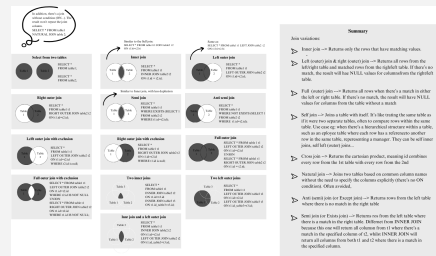
Eg:

Π BI, sigla [σ Quota > 20^Sigla <> 'KB'] (Pratica) --> The BI and Siglas of all the sports (table Pratica) that cost more than 20, except KB.

Π Nome [σ sigla = 'KB'] (Sócios ⋈ Pratica) --> name of all the people who do KB.

https://docs.google.com/document/d/1_70GykfmTwcU9TJ6Ji5um-lx-g2A7_VT2/edit

DQL Joining tables



Tables are joined by a common column (SELECT columns, FROM table1 INNER JOIN table2 ON table1.column=table2.column)

For **reunion**: (SELECT columnname FROM tablename) UNION (SELECT columnname FROM table2name)

For **intersection** (SELECT columnname FROM tablename) INTERSECT (SELECT columnname FROM table2name)

On access: - use NATURAL JOIN (for inner join);

Image source: https://www.reddit.com/r/SQL/comments/2zb1i0/sql_server_join_types_poster_version_2/

BD Example

Exemplo do Ginásio

Sócios	Desportos	Pratica
4028 João	KB	1078 AE 25
5819 Rui	NT	5819 KB 30
4520 Maria	AE	4520 KB 30
3162 Rita	AE	4520 NT 30
9876 Luís		3162 KB 30
9999 Zé		3162 NT 30
		9999 AE 25
		9876 KB 0



DDL

CREATE TABLE creates a table
tablename (columnname type columnrestriction, columnname2 type columnrestriction, ...);

CREATE INDEX explicit creation of index (for efficiency for name ON tablename- (column asc, column desc,...);
ex). Unique and primary keys will automatically create indexes!

DROP TABLE deletes tables if there are no references to thi table ou if these specify ON DELETE CASCADE. In this case, it deletes the table and all the reference lines on the other tables that refer to the deleted table

CREATE VIEW creates a view that can be used as a table

Types: varchar2(n) = string of n characters variable size 1<4000, char(n) = string of n characters fixed size 1<255, number(p,s), date, timestamp...

Column restrictions: none, primary key, not null, unique, references, check. **Table restrictions:** primary key(col, col...), foreign key(col, col...), check, references. All these depend on the db.

DML

Insertion **INSERT INTO** adds a line with all the values in tablename **VALUES-** the specified order
(val, val, val...)

INSERT INTO tablename(col,col...) adds a line only with the values for the specified columns
VALUES(val,val...)

Modification **UPDATE** tablename all the lines that meet the cond
SET col1=expr1, have the col1 and col2 updated
col2=expr2 **WHERE** according to the expr1 and expr2
cond

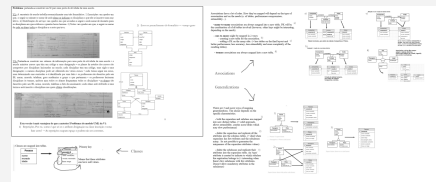
DML (cont)

Deletion **DELETE FROM** deletes all the line in the
tablename **WHERE** table that meet the cond
cond

The changes stay in a temporary state. To **commit** them permanently execut **COMMIT**. To **undo** the changes after the last commit do **ROLLBACK**.

It's possible to create **sequences** to automatically create values. Eg: create sequence num_socio start with 1000 increment by 10; insert into sócios values(num_socio.nextval, 'Quim'); select num_socio.currval from dual; --> Crie uma sequência para gerar automaticamente números de sócios

UML to SQL



Operators, Patterns & Symbols

+	plus
-	minus
*	times
/	divided
	concatenation
=	equal to
<>	different
!=	different
>	greater than
<	less than
>=	greater than or equal to
<=	less than or equal to
[not] in	belongs [doesn't belong]
[not] between x and y	x <= value <= y [not]
x [not] like y	compares x to y
is [not] null	is[n't] null

Operators, Patterns & Symbols (cont)

not	not
and	and
or	or
*	everything/all
_	any letter (only 1)
%	any sequence of characters
()	fits queries inside other queries
distinct	eliminates duplicate rows

' ' - use for words

'M%' = Marina, M...

'M_r%' = Mar, Mari, Moreira...

'a__' = ant, add, alc....

On Microsoft Access use * (instead of %) and ? (instead of _)

Order of precedence:

1. Arithmetic operators (+ and - > * and / > ||)
2. Comparasion operators
3. Logic operators (not > and > or)

() --> SELEC by, salario FROM orienta WHERE salario = (SELECT max(salario) FROM orienta);

DQL Basics

SELECT rowname(s) FROM table name	displays all the info from the table on the row(s)
SELECT x FROM y WHERE anycriteria	displays all the x info, from table y, that meets the criteria
SELECT x FROM y WHERE criteria1 AND criteria2	diplays all the x info from table y, that meets the criteria 1 and 2
SELECT x, j FROM y ORDER BY j	displays all the x and j row's info, from y table, ordered by j
SELECT x, i FROM y GROUP BY x	displays the x and i info from table y, organized by x groups

DQL Basics (cont)

SELECT x, i FROM y displays the x and i info from table y
GROUP BY x HAVING that fits the criteria, organized by the x. criteria

ORDER BY applies to strings (alphabetically) and numbers (asc), and applies for more than one rows. Use **desc** to order backwards (SELECT x, j, i FROM y ORDER BY i, j desc).

GROUP BY organizes rows by a specific column.

Example: SELECT id, avg(classification) as grade FROM students GROUP BY id --> will calculate the average classification by id, taking that into account for the result on the grades column for ids that appear more than once.

DQL Simple calculations

SELECT avg(column-name) as newcolumnname FROM tablename displays the average result of the numbers in the column of the table chosen in a new columns called newcolumnname

SELECT count displays the number of rows on columnname

SELECT sum displays the addition of the numbers on the row

SELECT max displays the higher number on the column

SELECT min displays the smaller number

All of these can be used together (SELECT avg(x) as newname1, max(x) as newname2 FROM tablename);

These are useful for as an example finding the average (avg) of a column, to count the total of rows of a column (count), the total of the values (sum) and the max and min numbers.



DQL - others

rownum	n. of the row for the resulting table
rowid	internal address for the row/line on the db
case --- when --- else - -- end as	turns quantitative results into qualitative
nvl(value, value-ifNull)	returns 'value' if it's not null and value-ifNull if value is null

eg: SELECT rownum, rowid, column1, column3 FROM table; and "- SELECT columnname, column2name, CASE column3name WHEN n. THEN 'expression' WHEN other. THEN 'otherexpression' ELSE 'anotherexpression' END AS newcolumnname FROM table; **Rownum** limits results to the first n lines for extensive outputs, while **rowid** allows quick access but is affected by import/export operations. **NVL** is also used as NVL(t, s, n), returning S if T is positive, otherwise N.

DCL

GRANT privilege (col1, col2) ON tablename TO username WITH grantoption

Types of privilege: alter, delete, execute, index, insert, read, references, select, update, create session, alter session, drop any table.

These apply to tables, views, sequences, functions, packages, system and/or users.

Technical support position

What type of queries are the most common on a technical support role? In this role, the most commonly used queries often involve retrieving and updating information related to users, tickets, issues, and system logs; data retrieval and correction; account management; configuration changes; audit trail analysis; performance tuning; report generation; data import/export issues. Egs:

1- Retrieve ticket information: SELECT * FROM tickets WHERE ticket_id = 'XYZ'

2- Update ticket status: UPDATE tickets SET status = 'closed' WHERE ticket_id = 'XYZ'

Technical support position (cont)

- Review system logs to identify patterns or issues affecting multiple users. SELECT * FROM system_logs WHERE log_type = 'Error' ORDER BY timestamp DESC LIMIT 10
- Track user activity and interactions with the system for troubleshooting purposes. SELECT * FROM user_activity WHERE user_id = 'ABC' ORDER BY timestamp DESC LIMIT 10
- Update user information. UPDATE users SET email = 'new_email@example.com' WHERE user_id = 'ABC'
- Check the status of a service. SELECT * FROM service_status WHERE status = 'Down';
- Retrieve FAQ information from a knowledge base or FAQ database to provide quick solutions to common issues. SELECT * FROM faq WHERE category = 'Troubleshooting'.
- User authentication issues: check if user's credentials are valid. SELECT * FROM users WHERE username = 'user123' AND password = 'hashed_password'
- Reset user passwords. UPDATE users SET password = 'new_hashed_password' WHERE username = 'user123'
- Check system resource usage: monitor resource usage to identify potential performance issues. SELECT * FROM system_resources WHERE resource_type = 'cpu' AND usage_percentage > 90;
- Check recent system updates. SELECT * FROM system_updates ORDER BY update_date DESC LIMIT 10



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