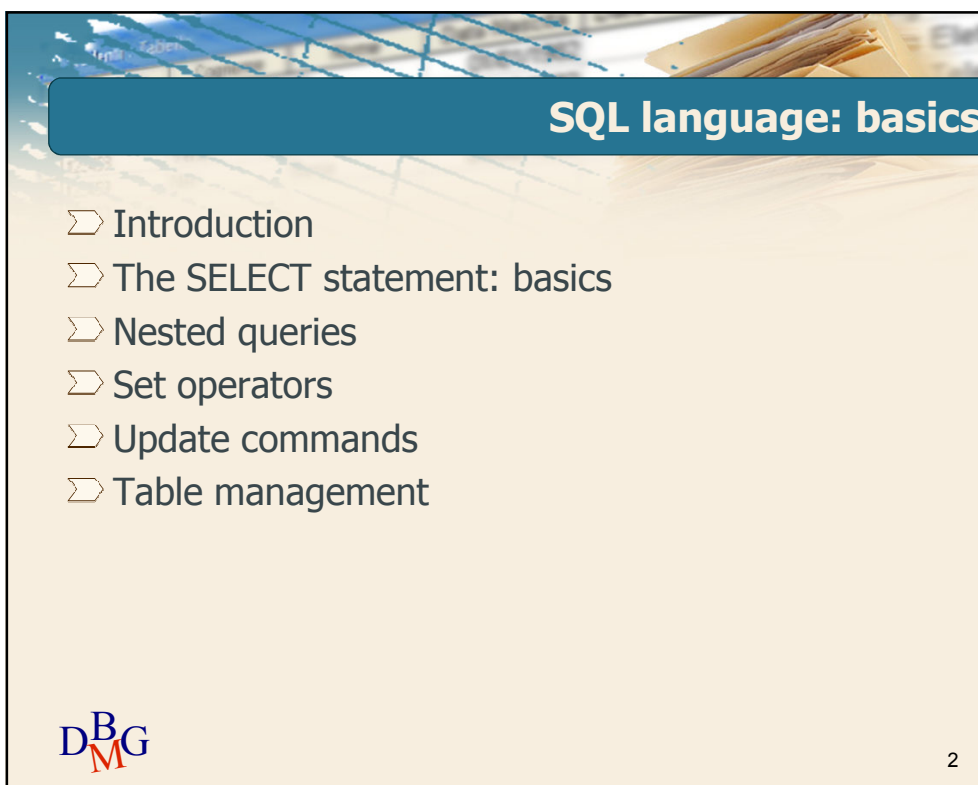**Databases**

Unit 3
SQL language: basics

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SQL language: basics

◇ Introduction
◇ The SELECT statement: basics
◇ Nested queries
◇ Set operators
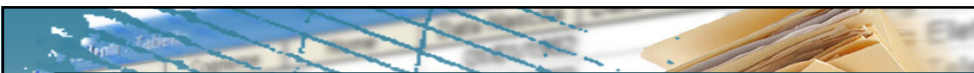◇ Update commands
◇ Table management

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SQL language: basics

Introduction

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Introduction

$\Rightarrow$ Introduction to the SQL language
$\Rightarrow$ Language commands
$\Rightarrow$ Notation

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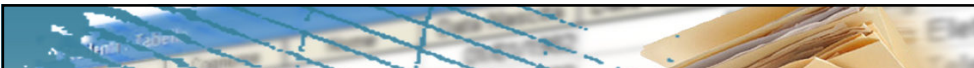# Introduction

Introduction to the SQL language

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The SQL language

▷ A language for managing relational databases
- Structured Query Language

▷ SQL provides commands to
- define the schema of a relational database
- read and write data
- define the schema of derived tables
- definire user access priviliges
- manage transactions

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The SQL language

⟳ SQL is a *set-level* language
- operators are applied to relations
- the result is always a relation

⟳ SQL is a *declarative* language
- it describes *what to do* and not how to do it
- it has a higher level of abstraction compared to traditional programming languages

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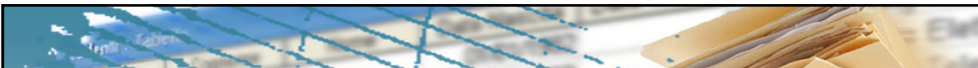
The SQL language

⟳ The language may be used in two ways
- interactive
- compiled
  - a host language encapsulates the SQL commands
  - SQL commands can be distinguished from the host language commands by means of appropriate syntactical devices

D^BG

Introduction

Language commands

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The SQL language

⇢ It can be subdivided into
- DML (Data Manipulation Language)
  - language for querying and updating the data
- DDL (Data Definition Language)
  - language for defining the database structure

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Data Manipulation Language

⇨ To query a database in order to extract the data of interest
  - SELECT
⇨ To modify a database instance
  - insertion of new information into a table
    - INSERT
  - update of the information in the database
    - UPDATE
  - deletion of obsolete data
    - DELETE

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Data Definition Language

⇨ To define a database schema
  - creation, modification and deletion of tables
    - CREATE, ALTER, DROP TABLE
⇨ To define derived tables
  - creation, modification and deletion of tables whose content is obtained from other database tables
    - CREATE, ALTER, DROP VIEW
⇨ To define complementary data structures for efficiently retrieving the data
  - creation and deletion of indices
    - CREATE, DROP INDEX

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Data Definition Language

▷ To define user access privileges
- grant and revocation of privileges on resources
  - GRANT, REVOKE

▷ To define transactions
- termination of a transaction
  - COMMIT, ROLLBACK

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Evolution of the SQL standard

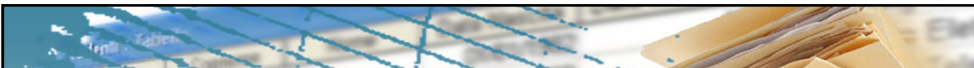| Informal name	Official name	Features
Basic SQL	SQL-86	Basic constructs
	SQL-89	Referential integrity
SQL-2	SQL-92	Relational model Several new constructs 3 levels: entry, intermediate, full
SQL-3	SQL:1999	Object-relational model Organized into multiple parts Triggers, external functions, …
	SQL:2003	Extensions to the object model Removal of unused constructs New parts: SQL/JRT, SQL/XML

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Introduzione

Notation

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Syntax of SQL commands

▷ Notation
- language keywords
  - upper case, dark blue color
- variable terms
  - italic font

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Syntax of SQL commands

▷ Grammar
- angle brackets < >
  - to isolate a syntactic term
- square brackets [ ]
  - to mark that the enclosed term is optional
- braces { }
  - to mark that the enclosed term may not appear or may repeated an arbitrary number of items
- vertical bar |
  - to mark that the term must be chosen among those separated by the bars

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Example database

▷ Supplier and part DB
- table P: it describes the available products
  - primary key: PId
- table S: it describes the suppliers
  - primary key: SId
- table SP: it describes supplies, by relating each product to the suppliers that provide it
  - primary key: (SId, PId)

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Instance of the example database

P

PId	PName	Color	Size	Store
P1	Jumper	Red	40	London
P2	Jeans	Green	48	Paris
P3	Blouse	Blue	48	Rome
P4	Blouse	Red	44	London
P5	Skirt	Blue	40	Paris
P6	Shorts	Red	42	London

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Instance of the example database

S

SId	SName	#Employees	City
S1	Smith	20	London
S2	Jones	10	Paris
S3	Blake	30	Paris
S4	Clark	20	London
S5	Adams	30	Athens

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Instance of the example database

SP

SId	PId	Qty
S1	P1	300
S1	P2	200
S1	P3	400
S1	P4	200
S1	P5	100
S1	P6	100
S2	P1	300
S2	P2	400
S3	P2	200
S4	P3	200
S4	P4	300
S4	P5	400

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