Fourth-Generation Languages (4GLs)

- Non-procedural languages
- A user defines *what* is to be done, not how
- Examples:
  - SQL
  - QBE
  - Forms Generators
  - Report Generators

Introduction to SQL

- There are two broad families of computer languages:
  - declarative languages that are nonprocedural and describe ***what*** should be done
  - procedural languages such as C++ and Java that describe ***how*** things should be done
- SQL is declarative in the sense that users specify the result that they want, not how to derive it
- The SQL language compiler performs the work of generating a procedure to navigate the database and perform the desired task
- SQL provides an interface to an RDBMS

Introduction to SQL

- Structure Query Language(SQL) is a database query language used for storing and managing data in Relational DBMS
- SQL was the first commercial language introduced for E.F Codd's Relational model of database
- Today almost all RDBMS (MySql, Oracle, Infomix, Sybase, MS Access) use SQL as the standard database query language

History of SQL

- 1974, D. Chamberlin (IBM San Jose Laboratory) defined language called 'Structured English Query Language' (SEQUEL)
- 1976, revised version, SEQUEL/2 defined
  - Name subsequently changed to SQL for legal reasons

History of SQL

- **Still pronounced ‘see-quel’, though official pronunciation is ‘S-Q-L’**
- **IBM produced a prototype DBMS called *System R*, based on SEQUEL/2**

History of SQL

- Late 70s, ORACLE appeared; probably first commercial RDBMS based on SQL
- 1987, ANSI and ISO published initial standard for SQL
- 1989, ISO published addendum that defined 'Integrity Enhancement Feature'
- 1992, first major revision to ISO standard occurred, referred to as SQL2 or SQL/92
- 1999, SQL:1999 released with support for object-oriented data management
- Late 2003, SQL:2003 released

Writing SQL Commands

- **SQL statement consists of:**
  - ***reserved words***
  - ***user-defined words***
- **Reserved words**
  - **fixed part of SQL**
  - **Must be spelt exactly as required**
  - **Cannot be split across lines**
- **User-defined words**
  - **Made up by user**
  - **Represent names of database objects e.g. relations, columns, views**

Writing SQL Commands

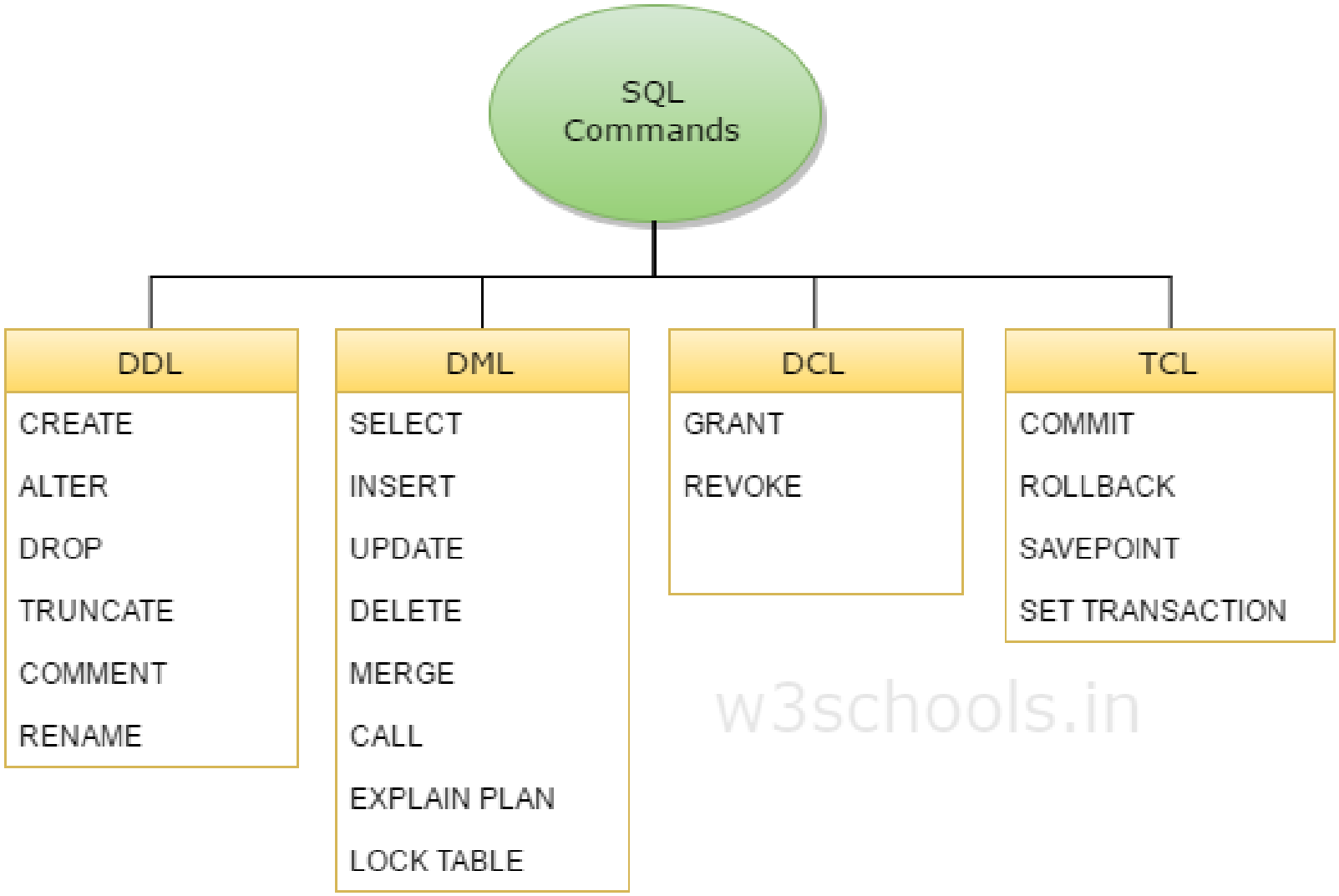
- **Most components of SQL statement - *case insensitive***
  - **Except for literal character data**
- **More readable with indentation and lineation:**
  - **Each clause should begin on new line**
  - **Start of clause should line up with start of other clauses**
  - **If clause has several parts, each should appear on separate line and be indented under start of clause**

Writing SQL Commands

- **Use extended BNF notation:**
  - **Upper-case letters represent reserved words**
  - **Lower-case letters represent user-defined words**
  - **| indicates *choice* among alternatives**
  - **Curly braces { } indicate *required element***
  - **Square brackets [ ] indicate *optional element*.**
  - **… indicates *optional repetition* (0 or more)**

Literals

- **Literals are constants used in SQL statements**
- **All non-numeric literals must be enclosed in single quotes (e.g. ‘London’)**
- **All numeric literals must not be enclosed in quotes (e.g. 650.00)**


SQL Commands
DDL
CREATE
ALTER
DROP
TRUNCATE
COMMENT
RENAME
DML
SELECT
INSERT
UPDATE
DELETE
MERGE
CALL
EXPLAIN PLAN
LOCK TABLE
DCL
GRANT
REVOKE
TCL
COMMIT
ROLLBACK
SAVEPOINT
SET TRANSACTION
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The Data Definition Language (DDL)

- Used to define or modify the schema of database objects
- Not used to manipulate data
- All DDL commands are auto-committed. That means it saves all the changes permanently in the database

DDL Commands

- CREATE – is used to create the database or its objects (like tables, indexes, functions, views, store procedures and triggers)
- DROP – is used to delete objects from the database
- ALTER-is used to alter the structure of the database objects
- TRUNCATE–is used to remove all records from a table

DML (Data Manipulation Language)

- Data manipulation language (DML) statements query or manipulate data in existing schema objects
- Whereas DDL statements enable you to change the structure of the database, DML statements enable you to query or change the contents
- For example, ALTER TABLE changes the structure of a table, whereas INSERT adds one or more rows to the table
- DML commands are not auto-committed. It means changes are not permanent to database, they can be rolled back

DML Commands

- SELECT – is used to retrieve data from one or more tables
- INSERT - It inserts data into a table
- UPDATE - It updates existing data within a table
- DELETE - It deletes records from a table

DCL (Data Control Language)

- Data control language are the commands to grant and take back authority from any database user

DCL Commands

- Grant - It gives user access privileges to a database
- Revoke - It takes back permissions from the user

TCL (Transaction Control Language)

- TCL commands deal with the transaction within the database

- What are Transactions?

- Transactions group a set of tasks into a single execution unit

TCL Commands

- COMMIT - It permanently saves the work done
- ROLLBACK - It restores the database to original since the last COMMIT

System Catalogs

- DBMS should have a user-accessible catalog or data dictionary
- A repository of information describing the data in the database, that is the ***meta-data*** or the “data about the data”