

# Database Management Systems

## Database Structuring and Querying with SQL

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# 1 Preliminaries

## 2 Data Definition

## 3 Data Manipulation

# Basics of SQL

SQL or structured query language is a special-purpose programming language designed for managing data held in a relational database management system (RDBMS). SQL uses a combination of relational algebra and relational calculus constructs.

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**Note:** The SQL keywords are case-insensitive, however, they are often written in uppercase. In some setups, table and column names are case-sensitive.

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- **Authorization** – includes commands for specifying access rights to relations and views.

# History

“An SQL query goes into a bar, walks up to two tables and asks,  
‘May I join you?’.”  
– Anonymous.

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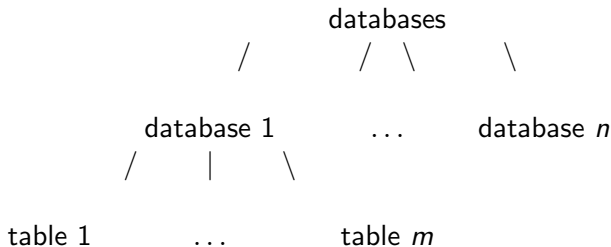
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**1999-2016:** The versions SQL:1999, SQL:2003, SQL:2006, SQL:2008, SQL:2011 and SQL:2016 were published.

# Data view through SQL

In practice, the databases (as a whole) comprises several separate database and each database consists of several tables.



**Note:** The MySQL Community Server can be downloaded from <https://dev.mysql.com/downloads/mysql>.

## Principle structure of defining a table

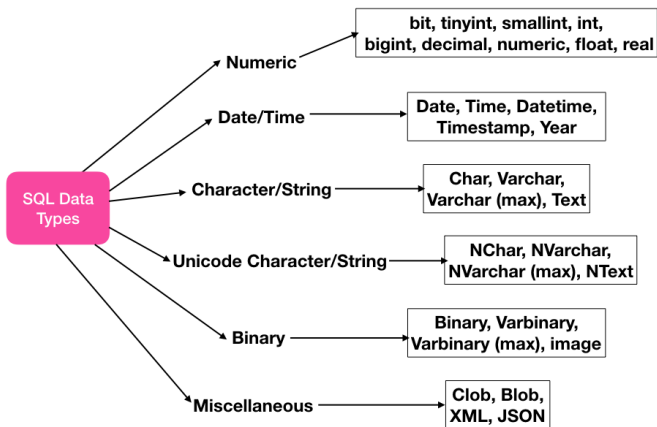
A typical SQL query for defining a table appears as follows:

```
create table  $R$ (  
 $A_1D_1, A_2D_2, \dots, A_kD_k,$   
 $(IC_1), \dots, (IC_l)$   
);
```

Here, each  $A_i$  represents an attribute in the schema of relation  $R$ , each  $D_i$  denotes the data type of values in the domain of the corresponding attribute  $A_i$ , and  $IC_i$  symbolizes an integrity-constraint.

**Note:** SQL is a freeform language.

# The data types in SQL



# Table creation with ease

**Try this out!!!**

SQLizer – Easily convert files into SQL databases

<https://sqlizer.io>

# Deleting a table

A typical SQL query for deleting a table appears as follows:

```
drop table R;
```

# Altering a table

A typical SQL query for altering a table by adding attributes appears as follows:

```
alter table  $R$  add  $A_i$ ;
```

A typical SQL query for altering a table by deleting attributes appears as follows:

```
alter table  $R$  drop  $A_i$ ;
```

# Principle structure of manipulating a table

A typical SQL query for data manipulation appears as follows:

```
select  $A_1, A_2, \dots, A_m$   
from  $R_1, R_2, \dots, R_n$   
where  $P$ ;
```

Here, each  $A_i$  represents an attribute, each  $R_i$  denotes a relation and  $P$  is a predicate.



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- The `select` clause corresponds to the projection operation of the relational algebra.
- The `from` clause corresponds to the Cartesian-product operation of the relational algebra.
- The `where` clause corresponds to the selection predicate of the relational algebra.

# Understanding the concepts in a better way

**Try this out!!!**

RAT – Relational Algebra Translator

<http://www.slinfo.una.ac.cr/rat/rat.html>