MySQL I

Objectives

- RDBMS Concepts
- Introduction to MySQL
- Using MySQL by GUI Tools

Introduction

- What is a Database?
  - A database is a separate application that stores a collection of data. Each database has one or more distinct APIs for creating, accessing, managing, searching and replicating the data it holds.
- Other kinds of data stores can also be used, such as files on the file system or large hash tables in memory but data fetching and writing would not be so fast and easy with those type of systems.
- Nowadays, we use relational database management systems (RDBMS) to store and manage huge volume of data. This is called relational database because all the data is stored into different tables and relations are established using primary keys or other keys known as Foreign Keys.

Introduction

- A Relational DataBase Management System (RDBMS) is a software that
  - Enables you to implement a database with tables, columns and indexes.
  - Guarantees the Referential Integrity between rows of various tables.
  - Updates the indexes automatically.
  - Interprets an SQL query and combines information from various tables.

Introduction

- RDBMS is the basis for SQL, and for all modern database systems such as MS SQL Server, IBM DB2, Oracle, MySQL, and Microsoft Access.
- The data in RDBMS is stored in database objects called tables. A table is a collection of related data entries and it consists of columns and rows.
- Every table is broken up into smaller entities called fields. A field is a column in a table that is designed to maintain specific information about every record in the table.
- A record, also called a row, is each individual entry that exists in a table.

RDBMS Terminology

- **Database**
  - A database is a collection of tables, with related data.
- **Table**
  - A table is a matrix with data. A table in a database looks like a simple spreadsheet.
- **Column**
  - One column (data element) contains data of one and the same kind, for example the column postcode.
- **Row**
  - A row (= tuple, entry or record) is a group of related data, for example the data of one subscription.
- **Redundancy**
  - Storing data twice, redundantly to make the system faster.
- **Primary Key**
  - A primary key is unique. A key value can not occur twice in one table. With a key, you can only find one row.

RDBMS Terminology

- **Foreign Key**
  - A foreign key is the linking pin between two tables.
- **Compound Key**
  - A compound key (composite key) is a key that consists of multiple columns, because one column is not sufficiently unique.
- **Index**
  - An index in a database resembles an index at the back of a book.
- **Referential Integrity**
  - Referential Integrity makes sure that a foreign key value always points to an existing row.

What is MySQL?

- MySQL is a database system used on the web
- MySQL is a database system that runs on a server
- MySQL is ideal for both small and large applications
- MySQL is very fast, reliable, and easy to use
- MySQL uses standard SQL
- MySQL compiles on a number of platforms
- MySQL is free to download and use
- MySQL is developed, distributed, and supported by Oracle Corporation
- The data in a MySQL database are stored in tables. A table is a collection of related data, and it consists of columns and rows.

MySQL Database

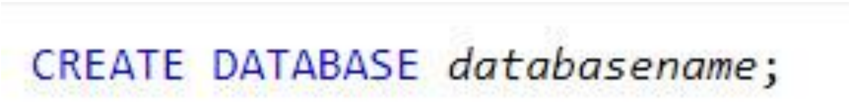
- MySQL is a fast, easy-to-use RDBMS being used for many small and big businesses. MySQL is developed, marketed and supported by MySQL AB, which is a Swedish company. MySQL is becoming so popular because of many good reasons:
  - MySQL is released under an open-source license. So you have nothing to pay to use it.
  - MySQL is a very powerful program in its own right. It handles a large subset of the functionality of the most expensive and powerful database packages.
  - MySQL uses a standard form of the well-known SQL data language.
  - MySQL works on many operating systems and with many languages including PHP, PERL, C, C++, JAVA, etc.
  - MySQL works very quickly and works well even with large data sets.
  - MySQL is very friendly to PHP, the most appreciated language for web development.

Demo

- Teacher demo steps to use MySQL through PHPMyAdmin

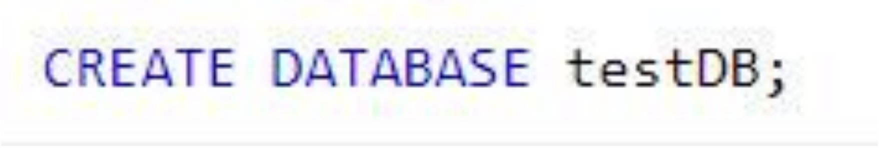
SQL CREATE DATABASE

- The CREATE DATABASE statement is used to create a new SQL database.
  - Make sure you have admin privilege before creating any database. Once a database is created, you can check it in the list of databases with the following SQL command: SHOW DATABASES;
- Syntax



```
CREATE DATABASE databasename;
```

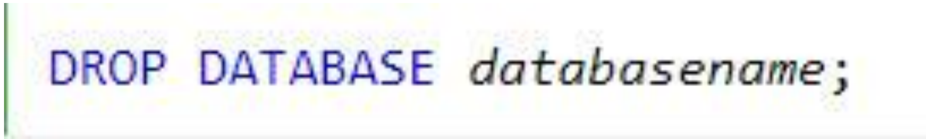
- Example



```
CREATE DATABASE testDB;
```

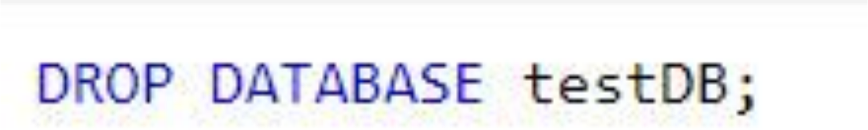
SQL DROP DATABASE

- The DROP DATABASE statement is used to drop an existing SQL database.
  - Be careful before dropping a database. Deleting a database will result in loss of complete information stored in the database !
- Syntax



```
DROP DATABASE databasename;
```

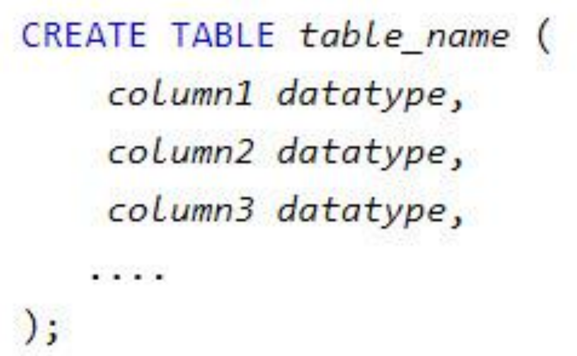
- Example



```
DROP DATABASE testDB;
```

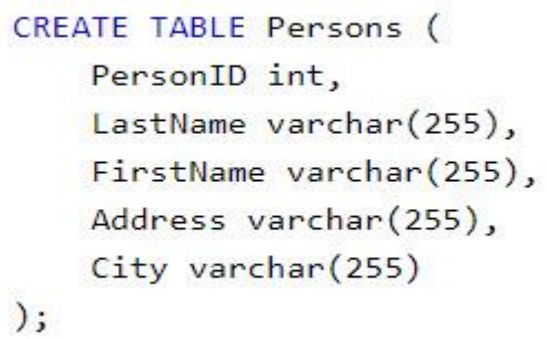
SQL CREATE TABLE

- The CREATE TABLE statement is used to create a new table in a database.
  - The column parameters specify the names of the columns of the table.
  - The datatype parameter specifies the type of data the column can hold (e.g. varchar, integer, date, etc.).
- Syntax



```
CREATE TABLE table_name (
    column1 datatype,
    column2 datatype,
    column3 datatype,
   ....
);
```

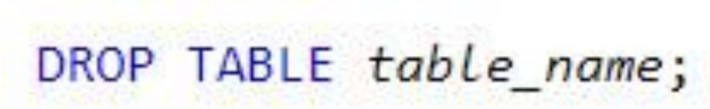
- Example



```
CREATE TABLE Persons (
    PersonID int,
    LastName varchar(255),
    FirstName varchar(255),
    Address varchar(255),
    City varchar(255)
);
```

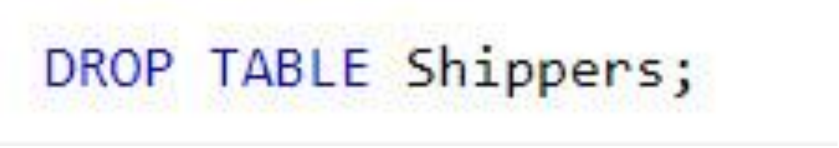
SQL DROP TABLE

- The DROP TABLE statement is used to drop an existing table in a database.
  - Be careful before dropping a table. Deleting a table will result in loss of complete information stored in the table.
- Syntax



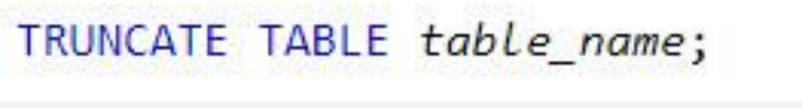
```
DROP TABLE table_name;
```

- Example



```
DROP TABLE Shippers;
```

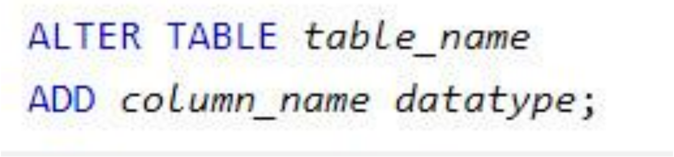
- SQL TRUNCATE TABLE
  - Is used to delete the data inside a table, but not the table itself.



```
TRUNCATE TABLE table_name;
```

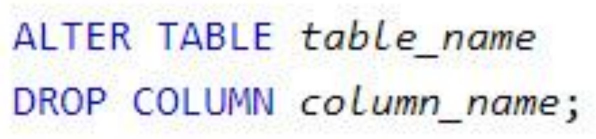
SQL ALTER TABLE

- The ALTER TABLE statement is used to add, delete, or modify columns in an existing table.
- The ALTER TABLE statement is also used to add and drop various constraints on an existing table.
- ALTER TABLE - ADD Column



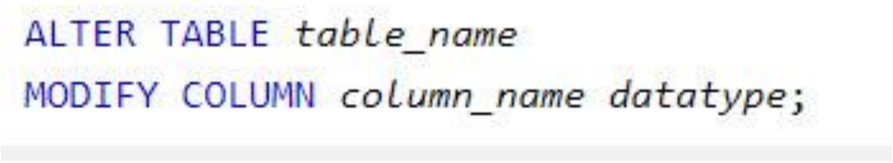
```
ALTER TABLE table_name
ADD column_name datatype;
```

- ALTER TABLE - DROP COLUMN



```
ALTER TABLE table_name
DROP COLUMN column_name;
```

- ALTER TABLE - ALTER/MODIFY COLUMN



```
ALTER TABLE table_name
MODIFY COLUMN column_name datatype;
```

SQL Constraints

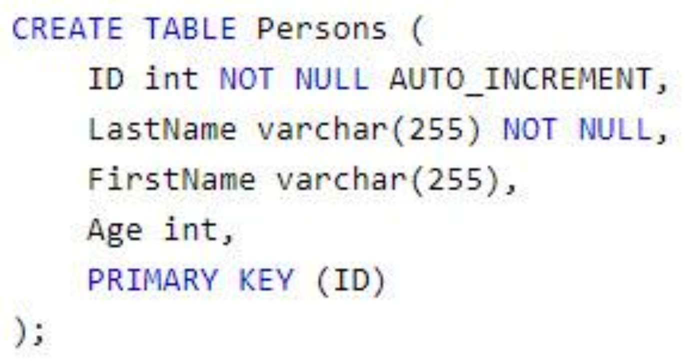
- SQL constraints are used to specify rules for the data in a table.
- Constraints are used to limit the type of data that can go into a table. This ensures the accuracy and reliability of the data in the table.
- If there is any violation between the constraint and the data action, the action is aborted.
- Constraints can be column level or table level. Column level constraints apply to a column, and table level constraints apply to the whole table.

SQL Constraints

- The following constraints are commonly used in SQL:
  - NOT NULL
    - Ensures that a column cannot have a NULL value
  - UNIQUE
    - Ensures that all values in a column are different
  - PRIMARY KEY
    - A combination of a NOT NULL and UNIQUE. Uniquely identifies each row in a table
  - FOREIGN KEY
    - Uniquely identifies a row/record in another table
  - CHECK
    - Ensures that all values in a column satisfies a specific condition
  - DEFAULT
    - Sets a default value for a column when no value is specified
  - INDEX
    - Used to create and retrieve data from the database very quickly

AUTO INCREMENT

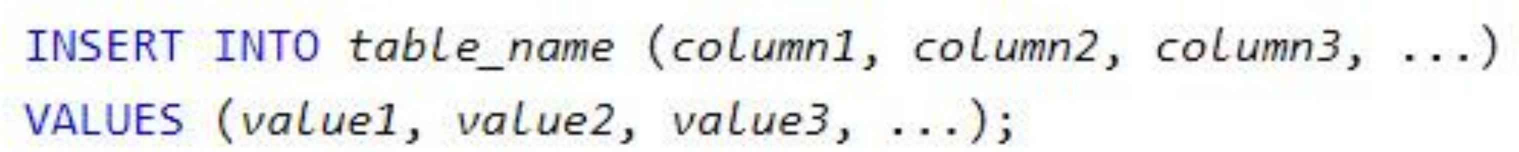
- Auto-increment allows a unique number to be generated automatically when a new record is inserted into a table.
- Often this is the primary key field that we would like to be created automatically every time a new record is inserted.
- MySQL uses the AUTO_INCREMENT keyword to perform an auto-increment feature.
- By default, the starting value for AUTO_INCREMENT is 1, and it will increment by 1 for each new record.
- Example



```
CREATE TABLE Persons (
    ID int NOT NULL AUTO_INCREMENT,
    LastName varchar(255) NOT NULL,
    FirstName varchar(255),
    Age int,
    PRIMARY KEY (ID)
);
```

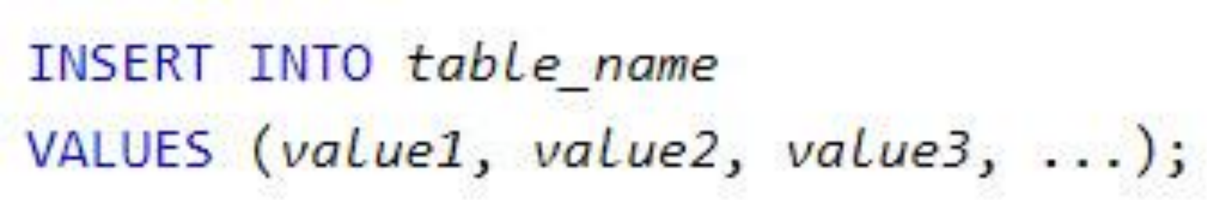
SQL INSERT INTO

- The INSERT INTO statement is used to insert new records in a table.
- It is possible to write the INSERT INTO statement in two ways.
  - The first way specifies both the column names and the values to be inserted



```
INSERT INTO table_name (column1, column2, column3, ...)
VALUES (value1, value2, value3, ...);
```

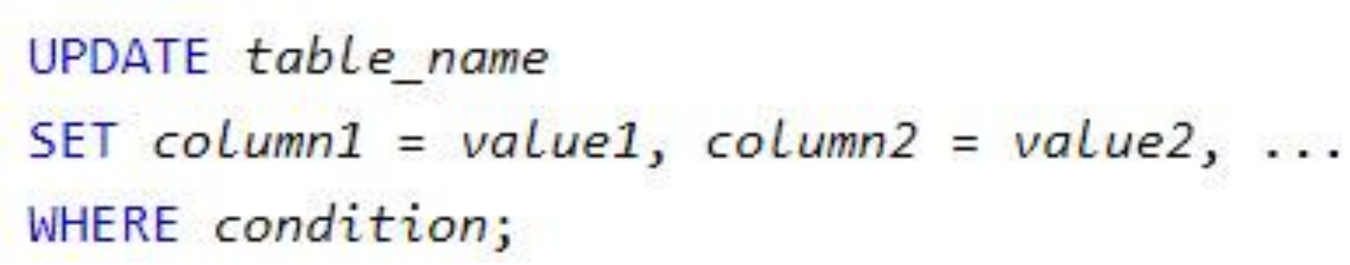
  - If you are adding values for all the columns of the table, you do not need to specify the column names in the SQL query. However, make sure the order of the values is in the same order as the columns in the table.



```
INSERT INTO table_name
VALUES (value1, value2, value3, ...);
```

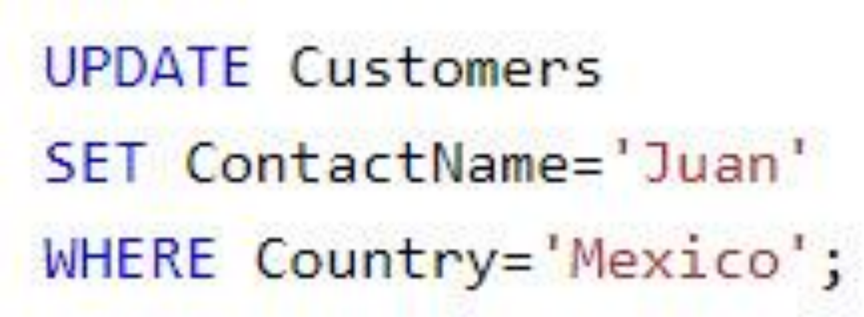
SQL UPDATE

- The UPDATE statement is used to modify the existing records in a table.
- Be careful when updating records. If you omit the WHERE clause, ALL records will be updated!
- Syntax



```
UPDATE table_name
SET column1 = value1, column2 = value2, ...
WHERE condition;
```

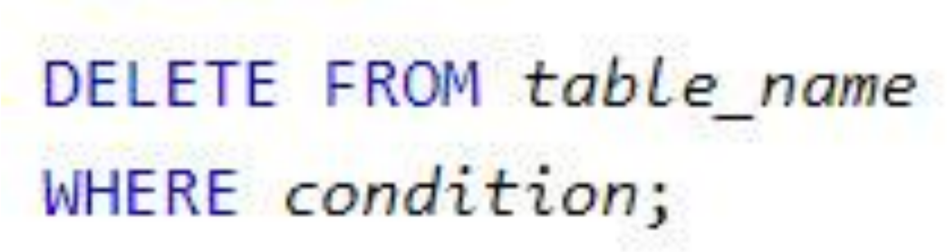
- Example



```
UPDATE Customers
SET ContactName='Juan'
WHERE Country='Mexico';
```

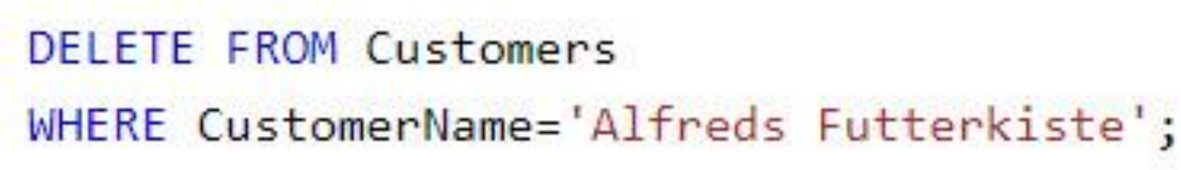
SQL DELETE

- The DELETE statement is used to delete existing records in a table.
  - Be careful when deleting records in a table! Notice the WHERE clause in the DELETE statement. The WHERE clause specifies which record(s) that should be deleted. If you omit the WHERE clause, all records in the table will be deleted!
- Syntax



```
DELETE FROM table_name
WHERE condition;
```

- Example



```
DELETE FROM Customers
WHERE CustomerName='Alfreds Futterkiste';
```

Demo

- Teacher demo
  - SQL insert/update/delete statements
  - a GUI MySQL administrator tool, such as: Toad, Navicat, MySQL Workbench etc.

Summary

- RDBMS Concepts
- Introduction to MySQL
- Using MySQL by GUI Tools