Databases and Tables

Databases

The CREATE DATABASE statement

- Syntax:
  CREATE DATABASE [IF NOT EXISTS] db_name;
- Example: create a database named *registration*
  ```
  CREATE DATABASE registration;
  ```
- Example: create a database named *registration* only if it doesn't exist
  ```
  CREATE DATABASE IF NOT EXISTS
  registration;
  ```

The DROP DATABASE statement

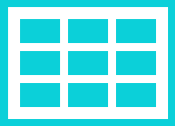
- Syntax
  DROP DATABASE [IF EXISTS] db_name
- Attempt to drop a database named registration
  `DROP DATABASE registration;`
- Drop a database named registration only if it exists
  `DROP DATABASE IF EXISTS registration;`

Listing the names of databases

```
mysql> show databases;
+--------------------+
| Database           |
+--------------------+
| information_schema |
| mysql              |
| performance_schema |
| registration       |
| soccer             |
| sys                |
+--------------------+
6 rows in set (0.00 sec)
```

Getting information about a database

To see the tables in a database
SHOW TABLES;

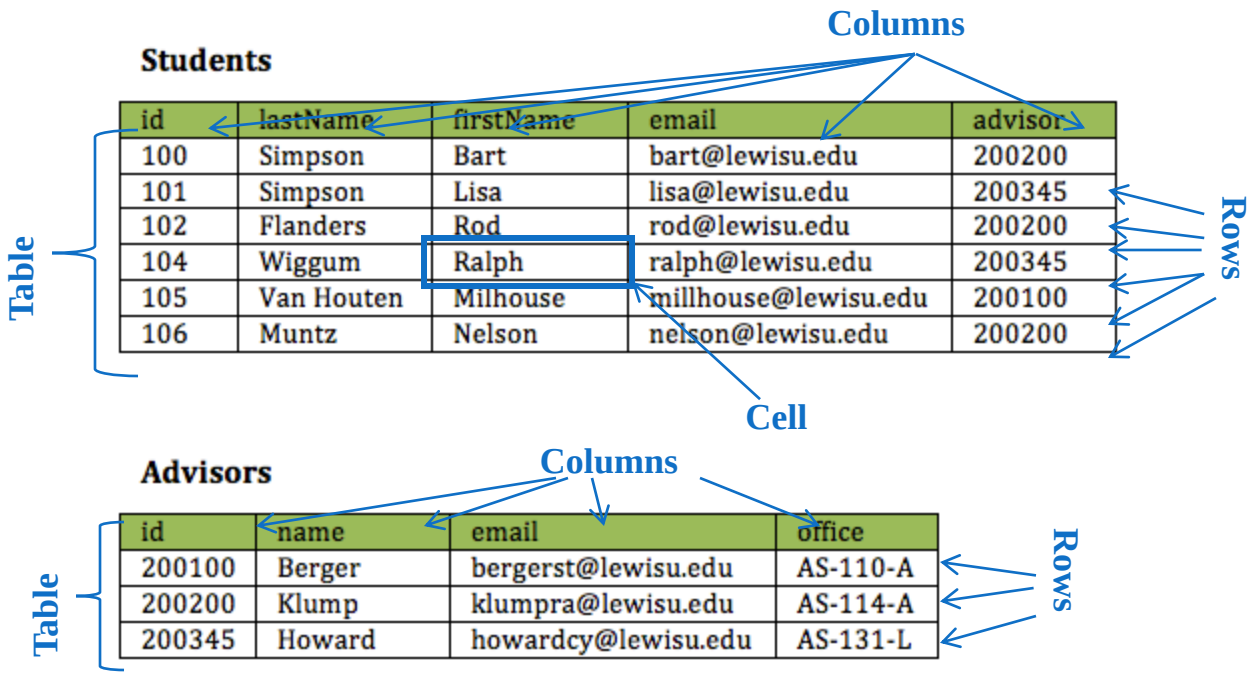


To see the columns in a table
SHOW COLUMNS FROM
table_name

Can also use DESCRIBE

Tables

Tables, Columns and Rows



Properties of Tables

- Table name is distinct from all other table names in database.
- Each cell of relation contains exactly one atomic (single) value.
- Each column has a distinct name.
- Each row is distinct; there are no duplicate rows.
- Order of attributes has no significance.
- Order of rows has no significance

A Database Table

Student ID	Last Name	First Name	Email	Major
100	Simpson	Bart	bart@mail.com	CS
200	Simpson	Lisa	lisa@mail.com	Math
300	Flanders	Rod	rod@mail.com	Business
400	Wiggum	Ralph	ralph@mail.com	Business
500	Van Houten	Milhouse	milhouse@mail.com	Math
600	Munz	Nelson	nelson@mail.com	Chemistry

Not Valid:
Multiple Entries per Cell

Student ID	Last Name	First Name	Email	Major
100	Simpson	Bart	bart@mail.com	CS
200	Simpson	Lisa	lisa@mail.com	Math, CS
300	Flanders	Rod	rod@mail.com	Business
400	Wiggum	Ralph	ralph@mail.com	Business
500	Van Houten	Milhouse	milhouse@mail.com	Math, Physics, CS
600	Munz	Nelson	nelson@mail.com	Chemistry

Not Valid:
Table with Required Row Order

Student ID	Last Name	First Name	Email	Major
100	Simpson	Bart	bart@mail.com	CS
200	Simpson	Lisa	lisa@mail.com	Math
				CS
300	Flanders	Rod	rod@mail.com	Business
400	Wiggum	Ralph	ralph@mail.com	Business
500	Van Houten	Milhouse	milhouse@mail.com	Math
				Physics
				CS
600	Munz	Nelson	nelson@mail.com	Chemistry

Data Independence

PHYSICAL STORAGE DOES NOT MATTER

ROWS AND COLUMNS OF A TABLE HAVE NO INHERENT ORDER

Create table statement

- Used to create a table with one or more columns of the specified data type

```
CREATE TABLE TableName (
  colName dataType,
  colName2 dataType,
  …
);
```

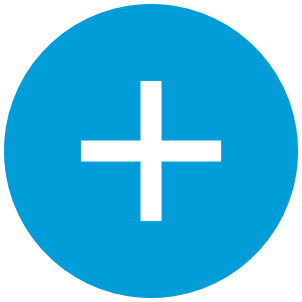
Category	Data type	Value
Integer	INT	-9281344
Decimal	FLOAT	3.1415
Character	CHAR	Chicago
Date and time	DATETIME	12/25/2020 10:35:00
Binary	BLOB	1001011101 . . .
Spatial	POINT	(2.5, 33.44)
Miscellaneous	MONEY	99.95 US Dollars

Sample Data Types

Example: CREATE TABLE

```
CREATE TABLE Player (
  id SMALLINT UNSIGNED,
  firstname VARCHAR(35),
  lastname VARCHAR(35),
  birthdate DATE
);
```

ALTER TABLE



ADD A NEW COLUMN TO A TABLE

CHANGE A COLUMN

DROP A COLUMN FROM A TABLE

Example: ALTER TABLE

- Modify Player table by adding a new column for player rating

```
ALTER TABLE Player
ADD rating CHAR(1);
```

- Modify Player table by increasing size for last name

```
ALTER TABLE Player
MODIFY lastname VARCHAR(40);
```

Deleting tables and table data

A statement that deletes a table from the current database

```
DROP TABLE Player;
```

A statement that deletes all data from a table

```
TRUNCATE TABLE Player;
```

Data Types

MySQL data type categories

- Character
- Numeric
- Date and time
- Large Object (LOB)
- Spatial

Character Types

CHAR

- Fixed length strings

VARCHAR

- variable length strings
- requires only the number of bytes needed to store the string + 1 byte

Character Storage Examples

Data Type	Original value	Value stored	Bytes used
CHAR(2)	'IL'	'IL'	2
CHAR(10)	'IL'	'IL'	10
VARCHAR(10)	'IL'	'IL'	3
VARCHAR(20)	'Illinois'	'Illinois'	9

Storing numeric values

- Some numeric values are better stored as strings
- Examples
  - Zip code
  - Telephone numbers
  - Social Security numbers

Integer Types

BIGINT	• Requires 8 bytes of storage
INT	• Requires 4 bytes of storage • INTEGER
MEDIUMINT	• Requires 3 bytes of storage
SMALLINT	• Requires 2 bytes of storage
TINYINT	• Require 1 byte of storage • BOOL or BOOLEAN

Fixed-point

- DECIMAL(M, D)
  - M is the maximum digits
  - D is the digits to the right of the decimal
  - Storage requirements vary

DECIMAL(9,2)	1.2	1.20
DECIMAL(9,2)	1234567.89	1234567.89
DECIMAL(9,2)	-1234567.89	-1234567.89
DECIMAL(18,9)	1234567.89	1234567.890000000

Floating-point type

Approximate numeric types	• May not represent the value exactly
DOUBLE	• 8 bytes
FLOAT	• 4 bytes

Number attributes

- UNSIGNED
  - Only positive numbers are stored
- ZEROFILL
  - Padded with zeroes from the left to the maximum display size
  - Specify a display size code in parentheses after the data type
    - Example: INT(4)

Date and Time Types

- DATE
- TIME
- DATETIME
  - Stores date and time
  - Requires 8 bytes
- TIMESTAMP
  - Stores date and time
  - But only up to 2038
  - Requires 4 bytes
- YEAR
  - Uses 4 digits by default
  - Can use YEAR(2) to store a 2-digit year

Date Literals

- The following literals all store 2016-08-15
  - '2016-08-15'
  - '2016-8-15'
  - '16-8-15'
  - '20160815'
  - 20160815
  - '2016.08.15'
  - '16/8/15'
- These are incorrect
  - '8/15/16'
  - '2016-02-31'

Time literals

- '2011-08-15 19:32:11' stores 2011-08-15 19:32:11
- '2011-08-15' stores 2011-08-15 00:00:00

ENUM and SET types

- Used to restrict the values that you store to a limited set of values
  - Acceptable values are defined when the table is created
- ENUM can store one value
- SET can store up to 64 different values
  - Values are stored in the order specified in the definition
  - Duplicate values are not stored

Large object types

- BLOB types stores strings of binary data
  - Binary Large Objects
  - Often used to store images, sounds and video
- TEXT store strings of character
  - Used to store large amount of character data

Data Type Implementations

Category	MySQL	Oracle	SQL Server
Integer	TINYINT SMALLINT MEDIUMINT BIGINT	INT NUMBER	TINYINT SMALLINT INT BIGINT
Decimal	FLOAT DOUBLE DECIMAL	FLOAT NUMBER	FLOAT NUMERIC DECIMAL
Date and Time	DATE DATETIME TIMESTAMP	DATE TIMESTAMP TIMESTAMP WITH TIMEZONE INTERVAL	DATE TIME DATETIME DATETIMEOFFSET
Character	CHAR VARCHAR TEXT	CHAR VARCHAR2 LONG	CHAR VARCHAR TEXT
Binary	TINYBLOB MEDIUMBLOB LONGBLOB	BLOB BFILE RAW	BINARY VARBINARY IMAGE
Spatial	POINT POLYGON GEOMETRY	SDO_GEOMETRY	POINT POLYGON
Miscellaneous	ENUM BOOLEAN BIT	XMLTYPE	MONEY XML BIT