SQL Basics

What is it?

- Stands for “Structured Query Language”
- Standard for storing and accessing information
- 3 Major “sub-languages” or components to SQL
  - DDL - Data Declaration Language
  - DML - Data Manipulation Language
  - DCL - Data Control Language

DDL Commands

- Commands affect the structure and storage of data
- Create new tables:
  `CREATE TABLE <table name> (<columns>);`
- Delete tables that already exist
  `DROP TABLE <table name>;`
- Change the table definition:
  `ALTER TABLE <table name> … ;`

DML - Data Manipulation Language

- Commands access and modify to the *contents* of database

- Read values out of the database:
  `SELECT * FROM users;`

- Put values into tables:
  `INSERT INTO users …;`

- Remove values from the database
  `DELETE FROM users …;`

DCL - Data Control Language

- Commands operate on data permissions
- Allow users to read data from a table:
  `GRANT SELECT ON <table> TO <user>;`
- Prohibit users from modifying specific tables:
  `REVOKE UPDATE ON <table> FROM <user>;`
- Won’t go into more depth. Differs between database implementations significantly.

SQL is **old**. Why are we still talking about it?

- Declarative language that describes “what you want” not “how to do it”

- Friendly format for both humans and machines

- Lack of better general-purpose alternatives

- Extremely flexible abstractions

Basic Abstractions

- A SQL database stores data in one more more tables

- Tables are a collection of columns that have names and data types

- Rows are entries in tables that may or may not have values for each column

- Primary Keys uniquely identify rows within the table

id	email_address	first_name	last_name	is_admin
1	jpetty@harrys.com	James	Petty	TRUE
2	chris@harrys.com	Chris	Clouten	TRUE
3	bigfoot@gmail.com	NULL	NULL	FALSE
4	imissthe70s@aol.com	Cher	NULL	FALSE

- Primary Key?
- Columns?
- Rows?
- What's this NULL thing?

DDL - Data Definition Language

```
CREATE TABLE users (
 id integer primary key,
 email_address varchar not null,
 first_name varchar,
 last_name varchar,
 is_admin boolean not null default false
);
```

id	email_address	first_name	last_name	is_admin
1	jpetty@harrys.com	James	Petty	TRUE
2	chris@harrys.com	Chris	Clouten	TRUE
3	bigfoot@gmail.com	NULL	NULL	FALSE
4	imissthe70s@aol.com	Cher	NULL	FALSE

Common SQL Data Types

Name	Description	Values
boolean	Values of either “yes” or “no”	{true, false}
integer	Whole numbers (including 0) including negative values.	{…, -2, -1, 0, 1, 2, …}
decimal(p,s)	Decimal value with precision *p* (total number of digits) and scale (number of fractional digits)	eg: decimal(5,2): [-999.99, 999.99]
char(n)	Text value with exact length (n)	Σ^n
varchar(n)	Text value with a variable length up to *n.*	$\Sigma^* = \bigcup \Sigma^n$ $n \in \mathbb{N} \cup \{0\}$

More SQL Data Types

Name	Description	Values
date	A date value including year, month, and day.	Varies by implementation
time	A time of day including hour, minute, second, and sometimes fractional seconds	00:00:00 - 24:00:00
timestamp	Combination of date with time, sometimes with timezone	Varies by implementation

DDL Column Definitions

- Columns *must* have a name and data type
- Columns *may* have constraints and a default value

name	data type	constraints	default value
id	integer	primary key	(it's complicated)
email_address	varchar	not null	None
first_name	varchar	None	NULL
last_name	varchar	None	NULL
is_admin	boolean	not null	FALSE

Interactive Time

- sqlite3 is a small, embeddable, SQL database engine that comes preinstalled with OS X

- make sure we can all run commands

- materials located here:

  https://pettyjamesm.github.io/mammoth-school-sql-intro/