Databases

What is a Database? What is it used for?

- A database is used to store large, complex collections of data. It makes searching, storing and updating large amounts of data easy.

- Why use a database?
  - to search data quickly and in various ways
  - to find relationships among data
  - to allow multiple users to access/modify data.

Relational Databases

- Data is organized into multiple tables.
- Columns represent variables/attributes.
- Rows are records/instances.
  - The number of rows changes as we add/delete data.

Table: Students

ID	Last name	First name
1765228	Smith	John
8735016	Brown	Alice
9002654	MacLeod	Alex

Table: Residents

ID	Room
1765448	120
9002654	121

Databases

- **SQL:** language for querying and maintaining relational databases
  - "Structured Query Language"
  - Pronounced "ess cue ell" or "sequel"
  - Can use in almost any database!

- **DataBase Management System (DBMS):** Software to allow users to interact with the database
  - We will use SQLite

SQLite in Python

```
import sqlite3
```

- This module contains functions for connecting to the database, and passing SQL commands and queries to the DBMS.

Example: Precipitation table

City	Snow	Total	Days
St.John's	322.1	1482	217
Charlottetown	338.7	1201	177
Halifax	261.4	1474	170
Fredericton	294.5	1131	156
Quebec	337.0	1208	178
Montreal	214.2	940	162
Ottawa	221.5	911	159
Toronto	135.0	819	139
Winnipeg	114.8	504	119
Regina	107.4	364	109
Edmonton	129.6	461	123
Calgary	135.4	399	111
Vancouver	54.9	1167	164
Victoria	46.9	858	153
Whitehorse	145.2	269	122
Yellowknife	143.9	267	118

Basic `sqlite3` usage

Connect to the database:

```
con = sqlite3.connect('name.db')
```

Get a cursor which is our link to the database:

```
cur = con.cursor()
```

After we edit our database, commit the changes:

```
con.commit()
```

Close the cursor when we are done:

```
cur.close()
```

Close the connection when we are done:

```
con.close()
```

Running SQL Commands

- We run SQL commands in python with:

```
cur.execute('SQL statement here')
```

- By convention, we write SQL keywords in uppercase and variables names in lowercase