Relational Databases

Topics

- Relational Databases
- Entities
- Relationships

What is a database?

Wikipedia says:

- “A database is an organized collection of data. The data are typically organized to model relevant aspects of reality in a way that supports processes requiring this information.”

Database Design

- What are the data entities of the system?
- What are the attributes of each entity?
- What are the constraints on the attributes of the entities?
- What can be used to uniquely identify entities in the system?
- How are the different entities related?

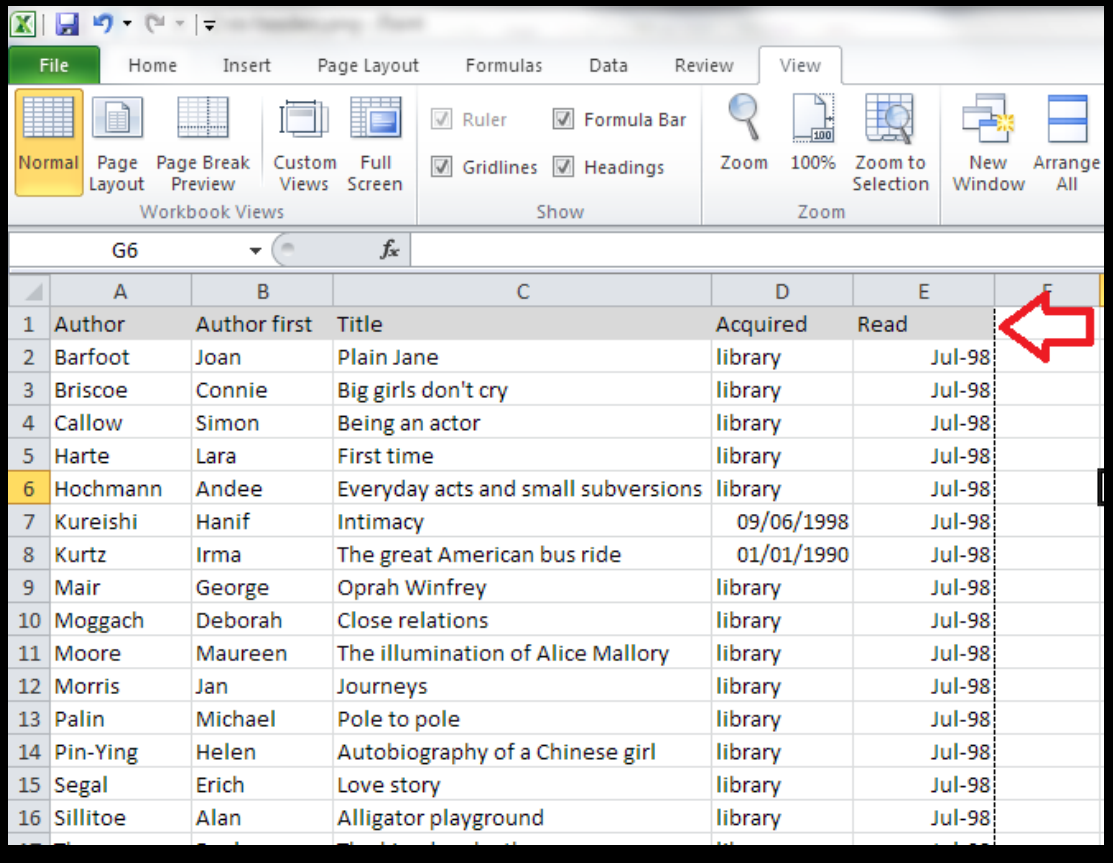
Entities

- A person, place or thing about which we want to collect and store multiple instances of data.
- Similar to an Object in Object Oriented Design
- Think of Entities as nouns
- These will be the tables in your database

Attributes

- Data that describes the Entities.
- These will be the columns of each table in your database.

Familiar concept?



	A	B	C	D	E	F
1	Author	Author first	Title	Acquired	Read	
2	Barfoot	Joan	Plain Jane	library	Jul-98	
3	Briscoe	Connie	Big girls don't cry	library	Jul-98	
4	Callow	Simon	Being an actor	library	Jul-98	
5	Harte	Lara	First time	library	Jul-98	
6	Hochmann	Andee	Everyday acts and small subversions	library	Jul-98	
7	Kureishi	Hanif	Intimacy	09/06/1998	Jul-98	
8	Kurtz	Irma	The great American bus ride	01/01/1990	Jul-98	
9	Mair	George	Oprah Winfrey	library	Jul-98	
10	Moggach	Deborah	Close relations	library	Jul-98	
11	Moore	Maureen	The illumination of Alice Mallory	library	Jul-98	
12	Morris	Jan	Journeys	library	Jul-98	
13	Palin	Michael	Pole to pole	library	Jul-98	
14	Pin-Ying	Helen	Autobiography of a Chinese girl	library	Jul-98	
15	Segal	Erich	Love story	library	Jul-98	
16	Sillitoe	Alan	Alligator playground	library	Jul-98	

Constraints

- Specific rules for the Attributes.
- Make sure that the data is consistent.
- In SQL:
  - NOT NULL
  - UNIQUE
  - CHECK
  - DEFAULT

How to access a record?

- Primary Key: attribute or combination of attributes that uniquely identify each row in the table.

Relationships

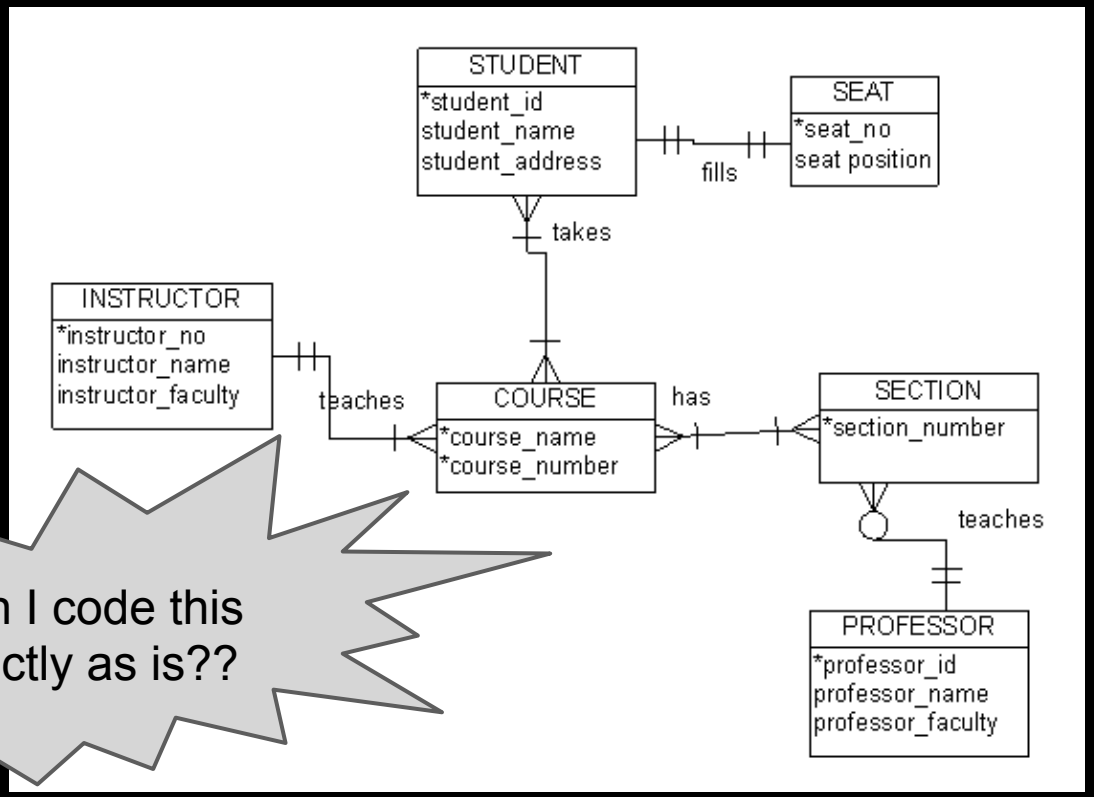
- Entities have some relationship to other entities in the system
- Illustrates an association between two entities.
- Cardinality Constraints:
  - Zero or More
  - One or More
  - One and only One
  - Zero or One

ERD

Entity-Relationship Diagram

- Data Model to describe a database in an abstract way
- Visually shows the relationships of data within the system
- We will use Crow's Foot Notation, because that is what real-world professionals use

ERD Example



Can I code this exactly as is??

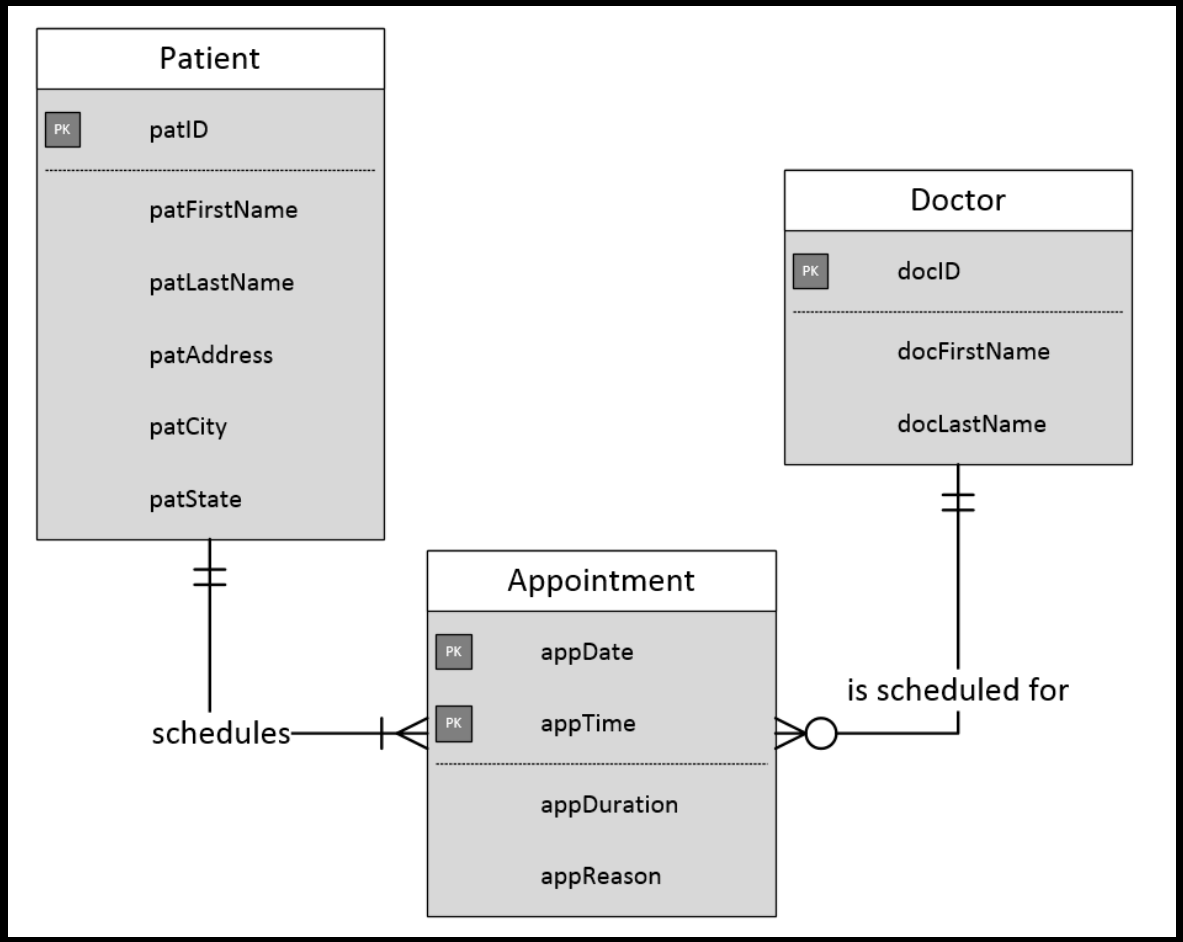
```
CREATE TABLE Student (
      student_id INT,
      student_name VARCHAR(30),
      student_address VARCHAR(40),
      PRIMARY KEY (student_id)
)

CREATE TABLE Course (
      course_name VARCHAR(20),
      course_number INT,
      PRIMARY KEY (course_name,
course_number)
)
```

```
CREATE TABLE Enrollment (
    student_id INT,
    course_name VARCHAR(20),
    course_number INT,
    PRIMARY KEY
     (student_id, course_name, course_number),
    FOREIGN KEY (student_id)
     REFERENCES Student(student_id),
    FOREIGN KEY (course_name, course_number)
     REFERENCES Course(course_name, course_number)
)
```

Example

Think about a system that keeps track of doctor appointments scheduled by patients.

- What would the entities (tables) be?
- What would be the attributes (fields/columns) of each entity?
- What uniquely identifies the entities? (primary keys)
- How are the entities related?


Patient
PK
patID
patFirstName
patLastName
patAddress
patCity
patState
Doctor
PK
docID
docFirstName
docLastName
Appointment
PK
appDate
PK
appTime
appDuration
appReason
schedules
is scheduled for