

1.

- a. There are 10 records in the file, and there are 9 fields per record.
- b. The city is recorded in the address field. The address field is made up of the street name and number, along with the city and state. It is impossible to search by just city since there is no dedicated city field. To fix this, the address should be stored in multiple fields... such as fields called "street", "city", and "state". An example would be:

C_Street	C_City	C_State
218 Fork Rd.	Bryan	TX
Box 12A	Fox	TX

- c. The address field is redundant because you can not search based on city. Also, some of the names are recorded with middle names, where others do not have middle names. When it comes to searching based on name, this may cause some anomalies because the user may not type the middle name.

2.

- a. A database is a collection of organized data that is related to something.
- b. A database management system is a type of software that allows a user to create a database and allows the user to store and retrieve data from the database. It also provides an interface for other software to interact with the database.
- c. A database system is a wholistic system that includes how the data is stored (hard drives, ssd, etc), what is stored (physical data), and how it is interacted with (dbms, software interfaces, APIs).

3. Chefs (cname, addr, phone)

Cooks (cname, dish)

- a.  $\pi_{cname} (\sigma_{dish = lasagna} (Cooks))$
- b.  $\pi_{dish} (\sigma_{cname = Alton} (Cooks))$
- c.  $\pi_{cname} (\sigma_{addr = 68\ N\ Marietta\ Pkwy} (Chefs))$

d.  $\pi_{cname}((\sigma_{dish = Tamales}(Cooks)) \cup (\sigma_{dish = Sopapillas}(Cooks)))$

e.  $\pi_{cname, addr}((\sigma_{dish = escargot}(Cooks)) \bowtie Chefs)$

4.

a.  $\pi_{Dept\#, Budget}(DEPT)$

b.  $\sigma_{DEPT\# = D1 \text{ or } DEPT\# = D2}(DEPT)$

c.  $(\sigma_{DEPT\# = D1 \text{ or } DEPT\# = D2}(DEPT)) \bowtie EMP$

d.  $\pi_{EMP\#, Salary}(\sigma_{Emp\# = E1 \text{ or } Emp\# = E4}(EMP))$