CMPSC 174A/174N Fundamentals of Database System

Entity-Relationship Model

Discussion Session
Friday, 9:00am-9:50am
Zexi Huang

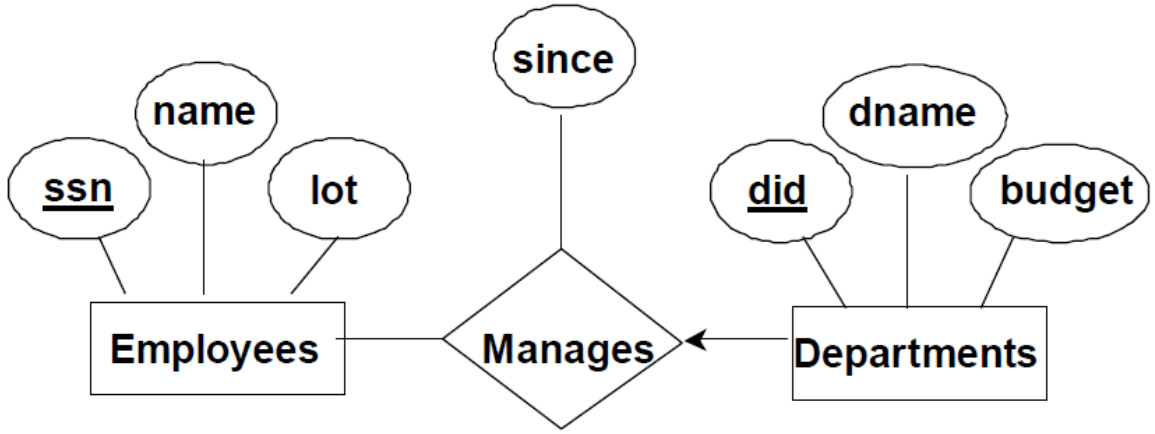
Session 2

Schedule

- Review entity-relationship model
  - Key Constraints
- Introduce additional features
  - Participation Constraints
  - Weak Entities
- Go through exercises
- Introduce other features
  - Aggregation
  - Class Hierarchies

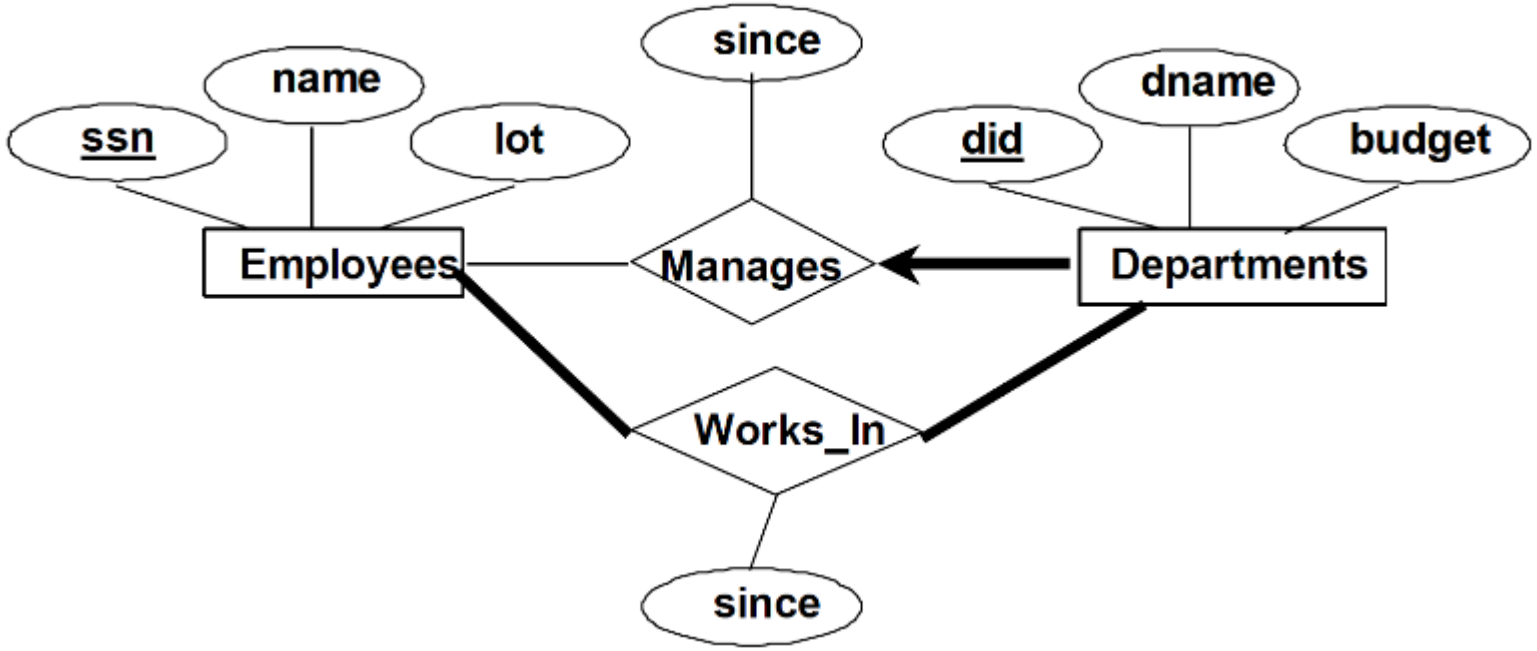
Entity-relationship Model

- **Entities: distinguishable objects**
  - Attributes
  - Key: minimal set of attributes that uniquely identify an entity
- **Relationship: association among entities**
  - Uniquely determined by the entities
  - Descriptive attributes
- **Key Constraints:**
  - An entity alone uniquely determines a relationship



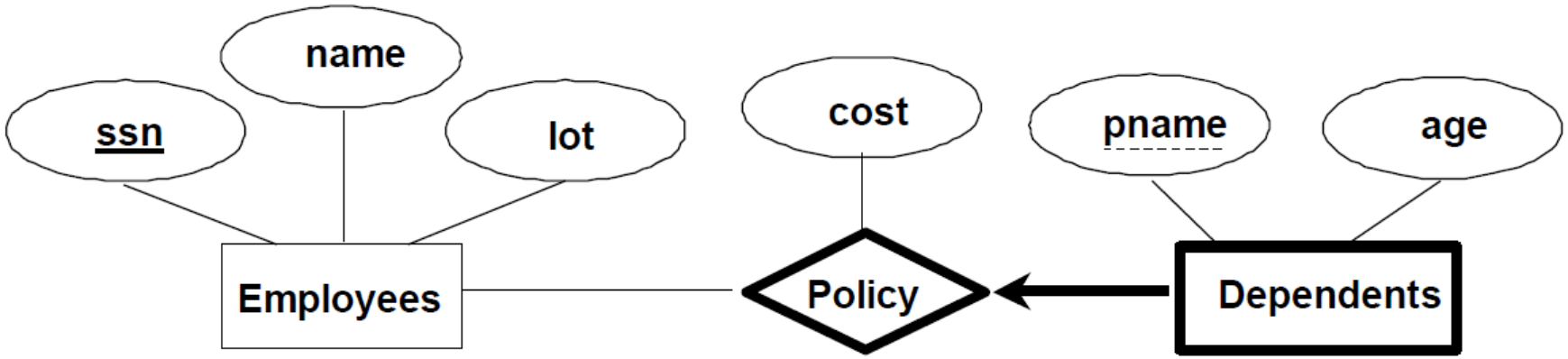
Participation Constraints

- **Participation Constraints:**
  - Total participation: every entity involves in a relationship set
  - Partial participation: otherwise



Weak Entities

- **Weak entities**
  - Uniquely identified by a partial key of itself and primary key of another entity
  - Identifying relationship
  - Key and participation constraints



Exercise 2.7

- **Exercise 2.7 The Prescriptions-R-X chain of pharmacies has offered to give you a free lifetime supply of medicine if you design its database. Given the rising cost of health care, you agree. Here's the information that you gather:**
  - Patients are identified by an SSN, and their names, addresses, and ages must be recorded.
  - Doctors are identified by an SSN. For each doctor, the name, specialty, and years of experience must be recorded.
  - Each pharmaceutical company is identified by name and has a phone number.
  - For each drug, the trade name and formula must be recorded. Each drug is sold by a given pharmaceutical company, and the trade name identifies a drug uniquely from among the products of that company. If a pharmaceutical company is deleted, you need not keep track of its products any longer.
  - Each pharmacy has a name, address, and phone number.

Exercise 2.7

- **Exercise 2.7 The Prescriptions-R-X chain of pharmacies has offered to give you a free lifetime supply of medicine if you design its database. Given the rising cost of health care, you agree. Here's the information that you gather:**
  - Every patient has a primary physician. Every doctor has at least one patient.
  - Each pharmacy can sell several drugs and has a price for each. A drug could be sold at several pharmacies, and the price could vary from one pharmacy to another.
  - Doctors prescribe drugs for patients. A doctor could prescribe one or more drugs for several patients, and a patient could obtain prescriptions from several doctors. Each prescription has a date and a quantity associated with it. You can assume that, if a doctor prescribes the same drug for the same patient more than once, only the last such prescription needs to be stored.
  - Pharmaceutical companies have long-term contracts with pharmacies. A pharmaceutical company can contract with several pharmacies, and a pharmacy can contract with several pharmaceutical companies. For each contract, you have to store a start date, an end date, and the text of the contract.
  - Pharmacies appoint a supervisor for each contract. There must always be a supervisor for each contract, but the contract supervisor can change over the lifetime of the contract.

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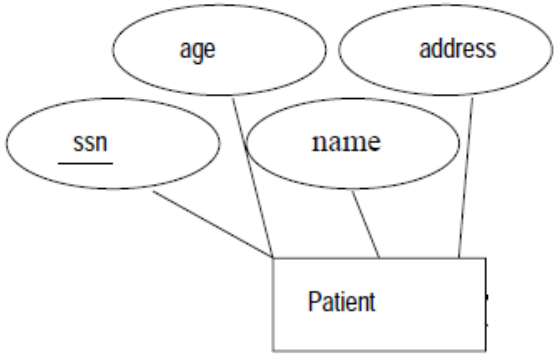
- *Patients* are **identified** by an *SSN*, and their *names*, *addresses*, and *ages* must be recorded.



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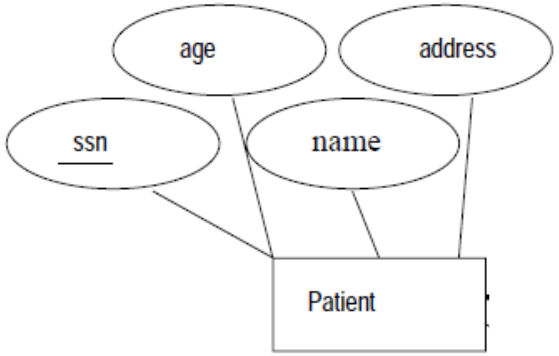
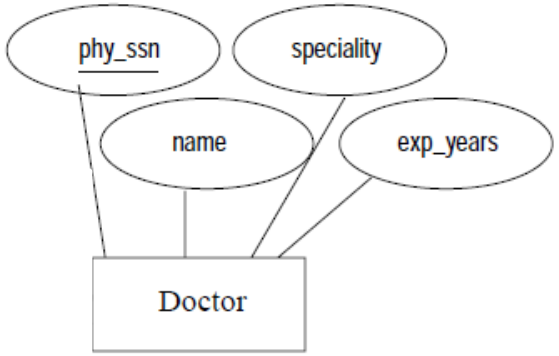
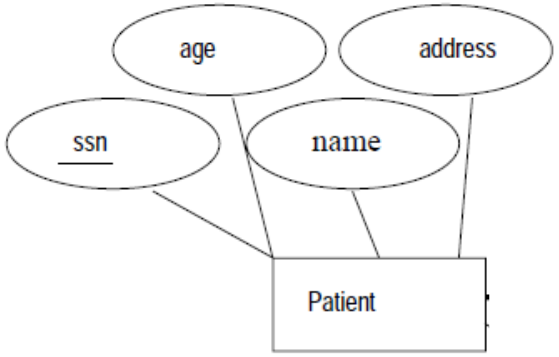
- *Doctors* are **identified** by an *SSN*. For each doctor, the *name*, *specialty*, and *years of experience* must be recorded.

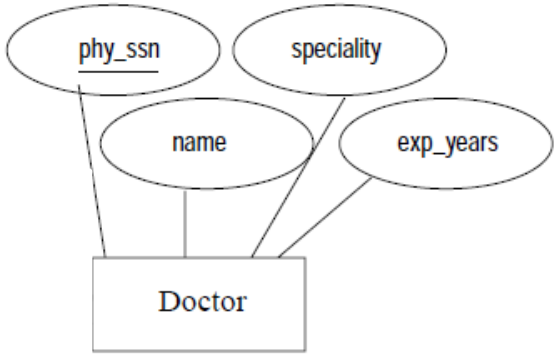


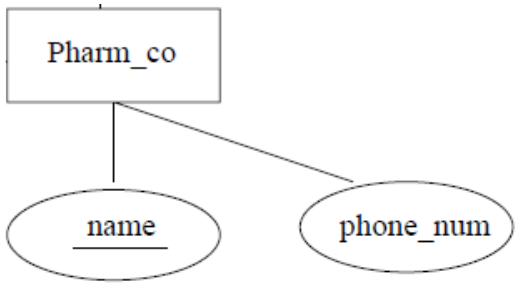


Exercise 2.7

- Each *pharmaceutical company* is **identified** by *name* and has a *phone number*.

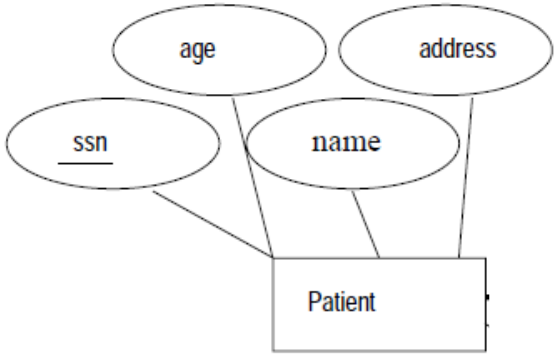


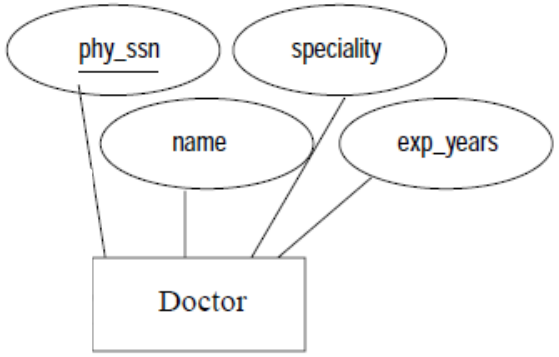


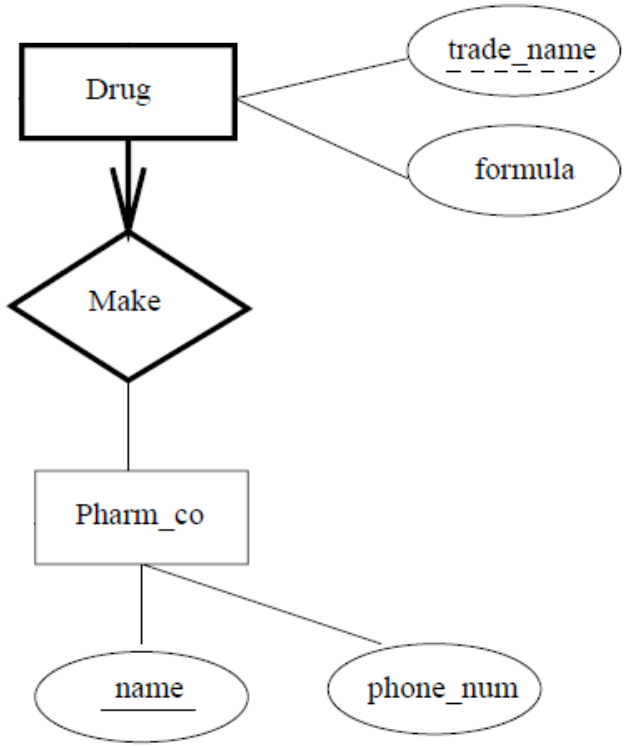


Exercise 2.7

- For each *drug*, the *trade name* and *formula* must be recorded. Each *drug* is sold by a given *pharmaceutical company*, and the *trade name* identifies a *drug* **uniquely** from among the *products* of that *company*. If a *pharmaceutical company* is deleted, you need not keep track of its *products* any longer.

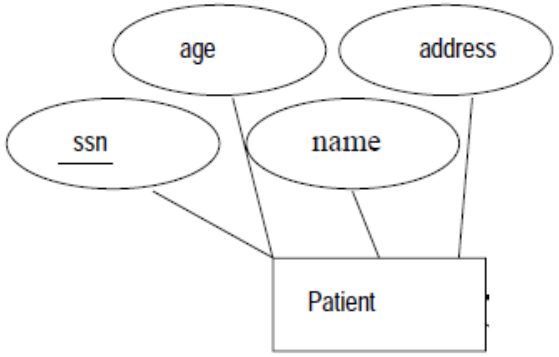


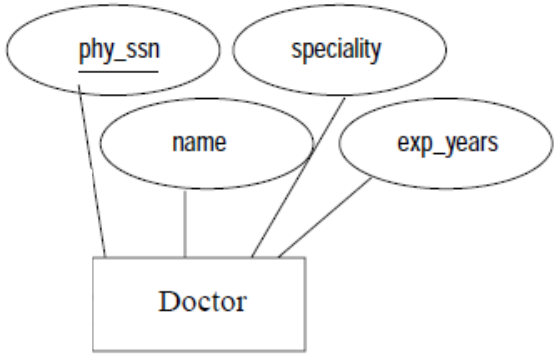


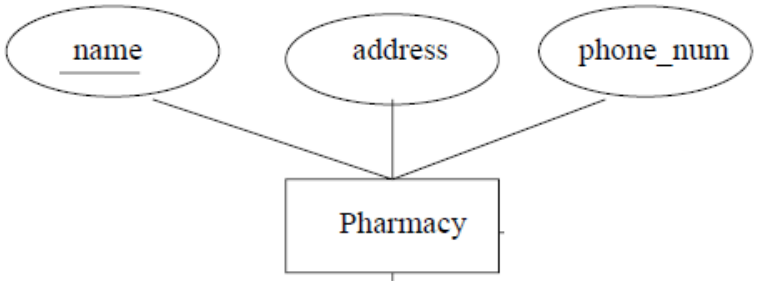


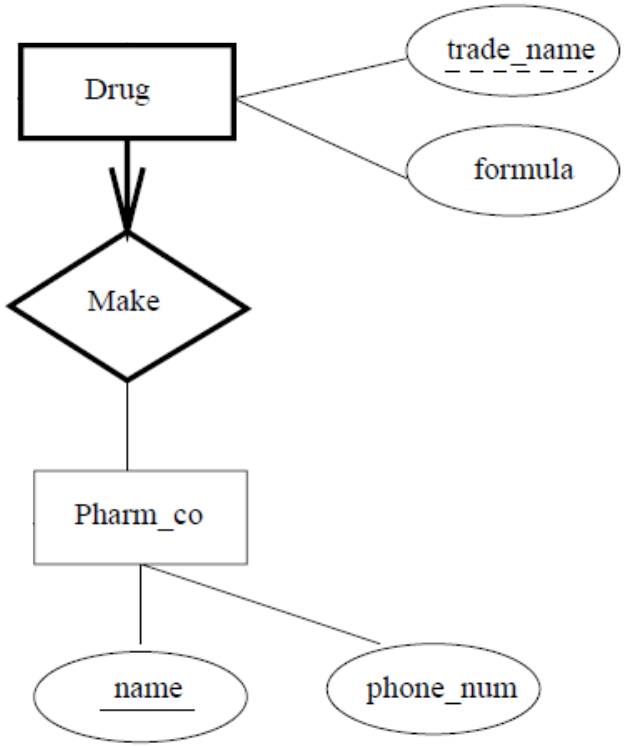
Exercise 2.7

- Each *pharmacy* has a *name*, *address*, and *phone number*.



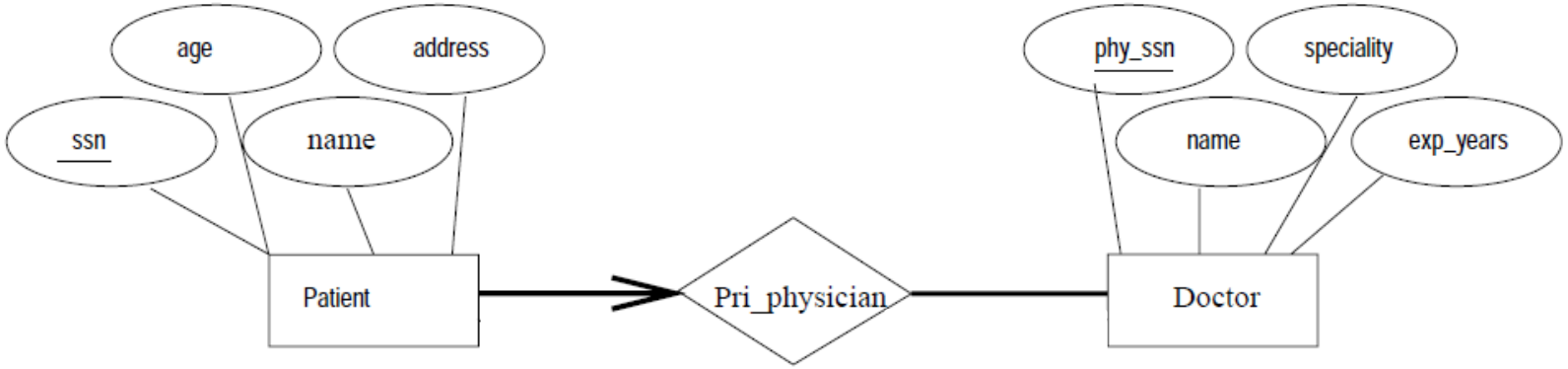


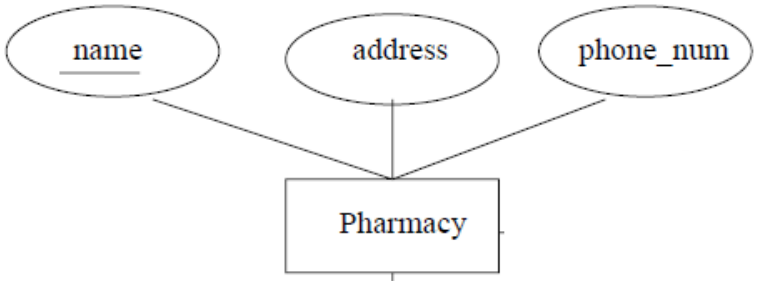


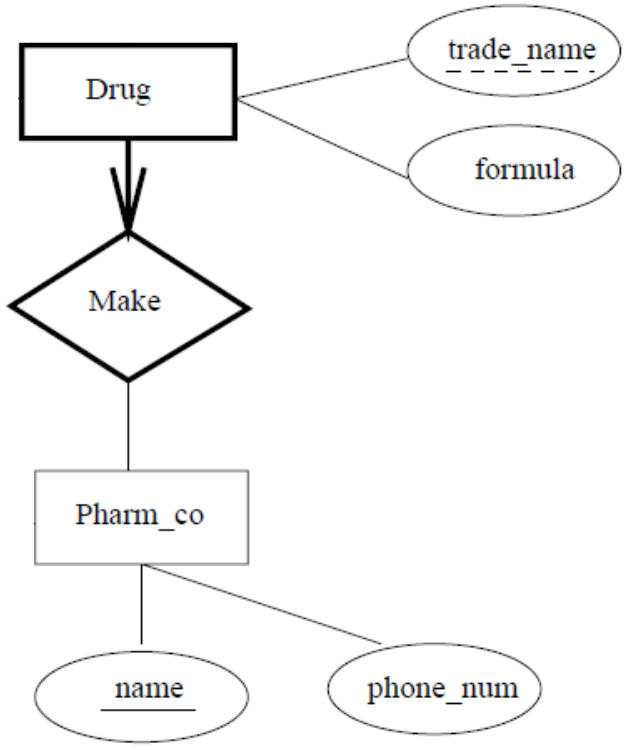


Exercise 2.7

- Every *patient* has **a** *primary physician*. Every *doctor* has **at least one** *patient*.

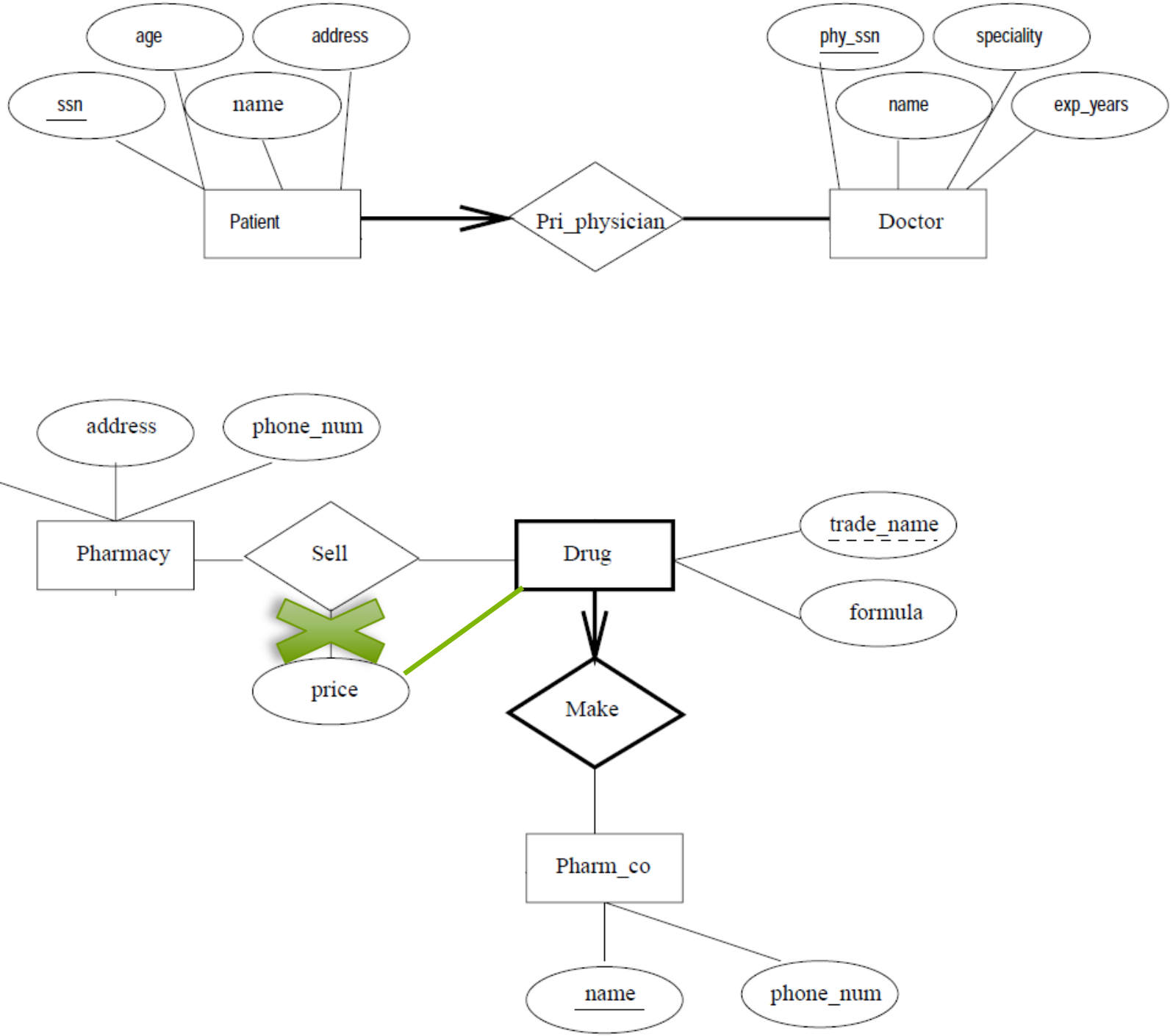






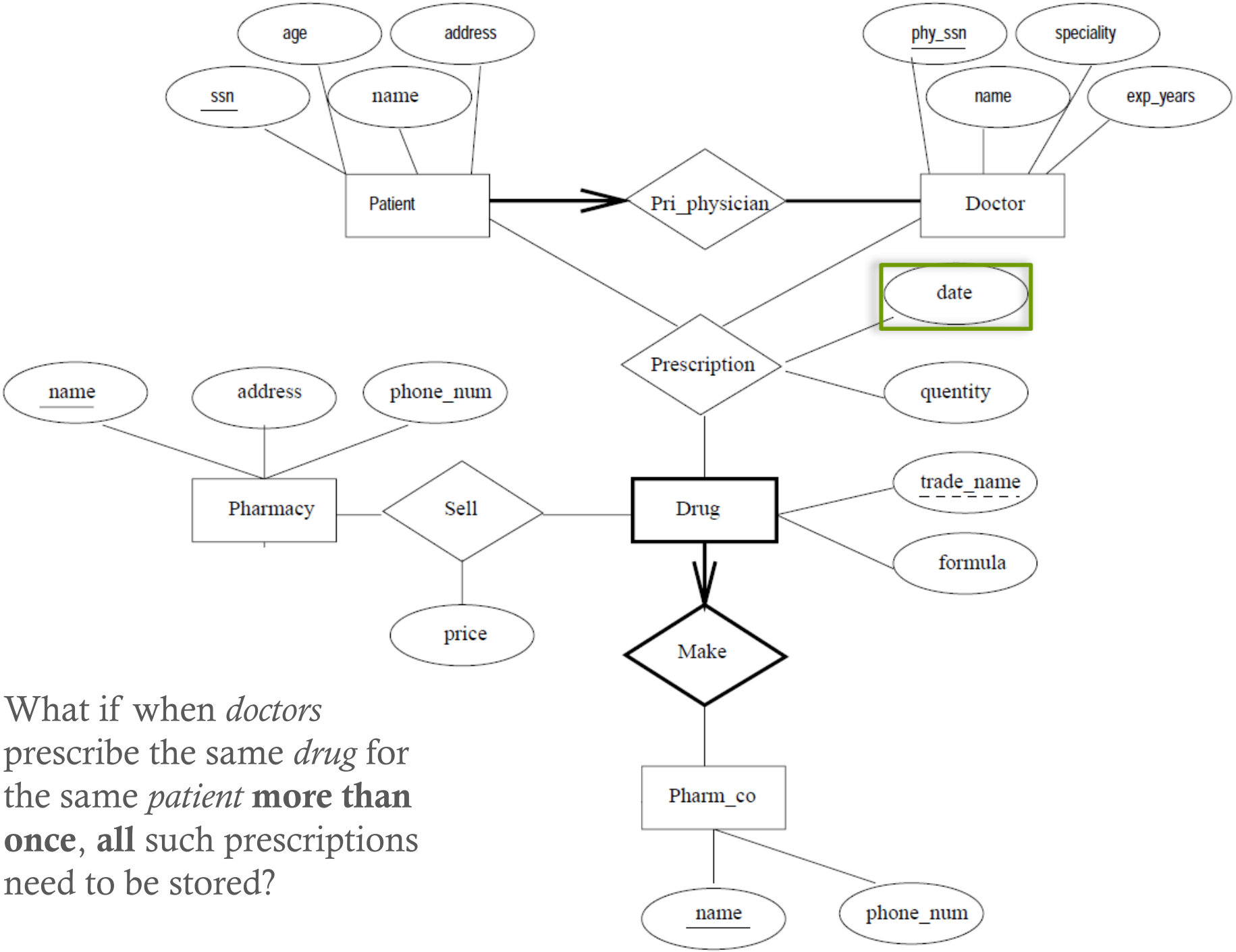
Exercise 2.7

- Each *pharmacy* can sell **several** *drugs* and has a *price* for each. A *drug* could be sold at **several** *pharmacies*, and the *price* could **vary** from one *pharmacy* to another.
- What if each *drug* is sold at a **fixed** *price* for all *pharmacies*?



Exercise 2.7

- *Doctors* prescribe *drugs* for *patients*. A *doctor* could prescribe **one or more** *drugs* for **several** *patients*, and a *patient* could obtain prescriptions from **several** *doctors*. Each prescription has a *date* and a *quantity* associated with it. You can assume that, if a *doctor* prescribes the same *drug* for the same *patient* **more than once**, **only the last** such prescription needs to be stored.



- What if when *doctors* prescribe the same *drug* for the same *patient* **more than once**, **all** such prescriptions need to be stored?

Exercise 2.7

- *Pharmaceutical companies* have long-term contracts with *pharmacies*. A *pharmaceutical company* can contract with **several** *pharmacies*, and a *pharmacy* can contract with **several** *pharmaceutical companies*. For each contract, you have to store a *start date*, an *end date*, and the *text* of the contract.
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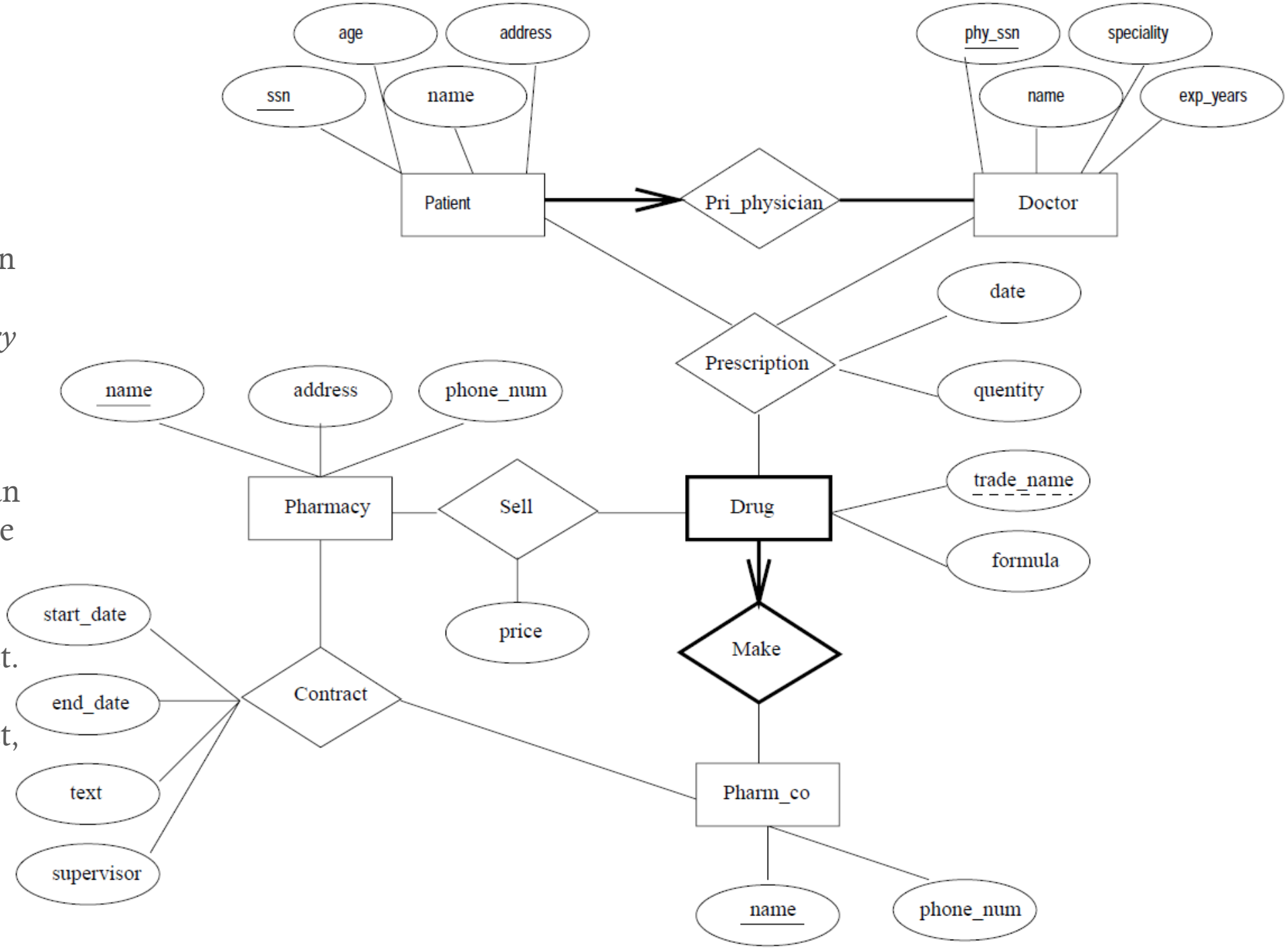
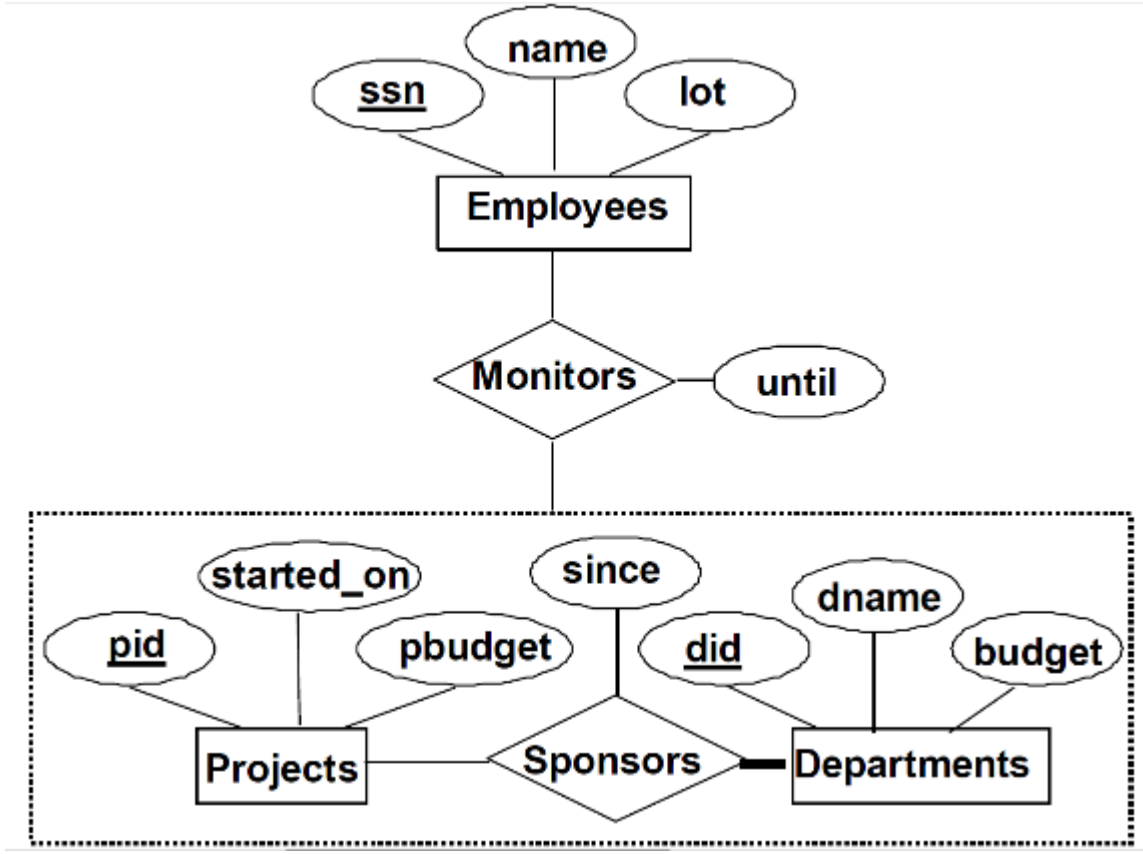


Aggregation

- **Aggregation:**
  - Model a relationship involving (entity sets and) a relationship set
  - Each relationship can have its own descriptive attributes



Class Hierarchies

- **Class Hierarchies:**
  - ISA: every A entity is also considered a B
  - Overlap constraints: whether each entity is allowed to be in more than one subclasses
  - Covering constraints: whether each superclass entity must belong to one of its subclasses