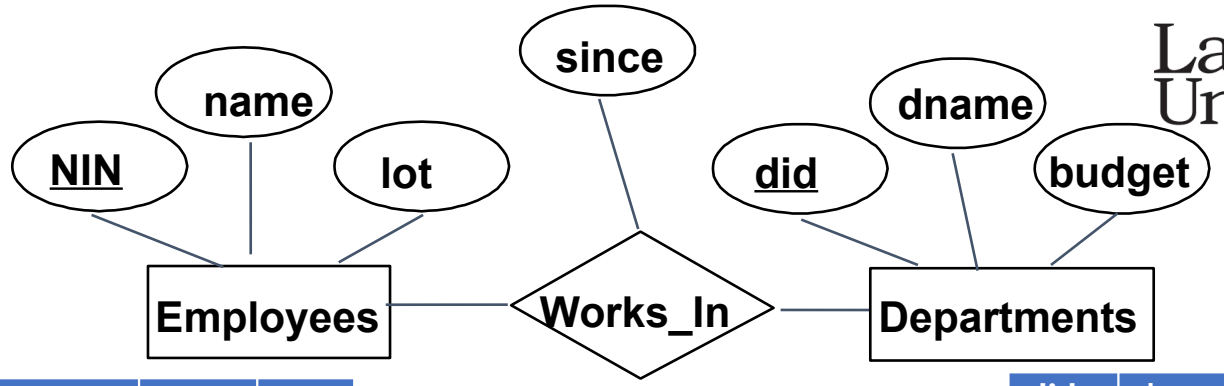
Welcome to WEEK 2….

FROM YOU…

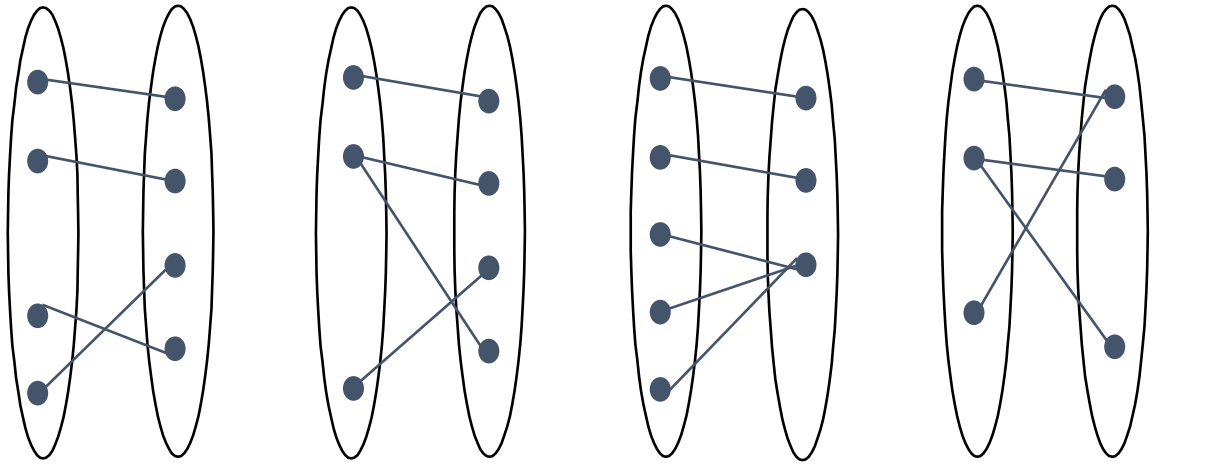
- Consider the works_in relationship
- If an employee can work in at most one department and a department can have multiple employees
- What type of relationship is that?



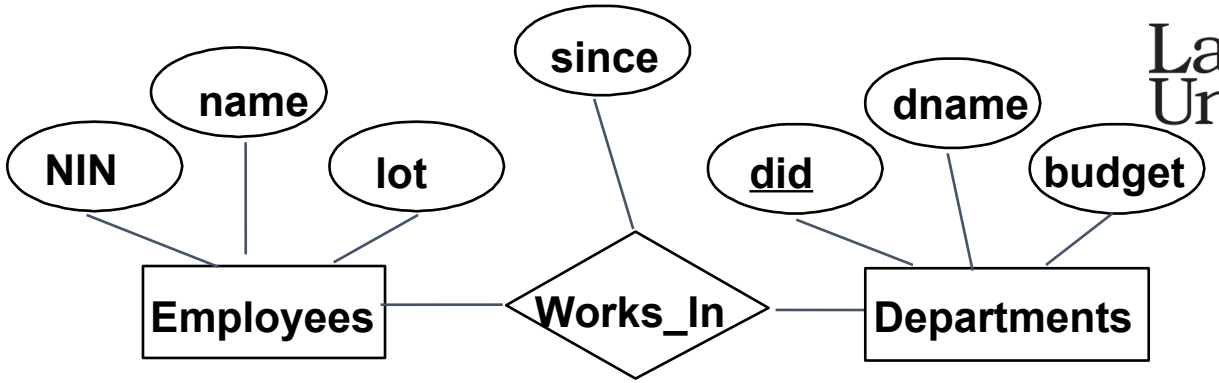
NIN	Name	Lot
8754702	Tom	75
6820937	Uraz	545
2313927	Nick	12

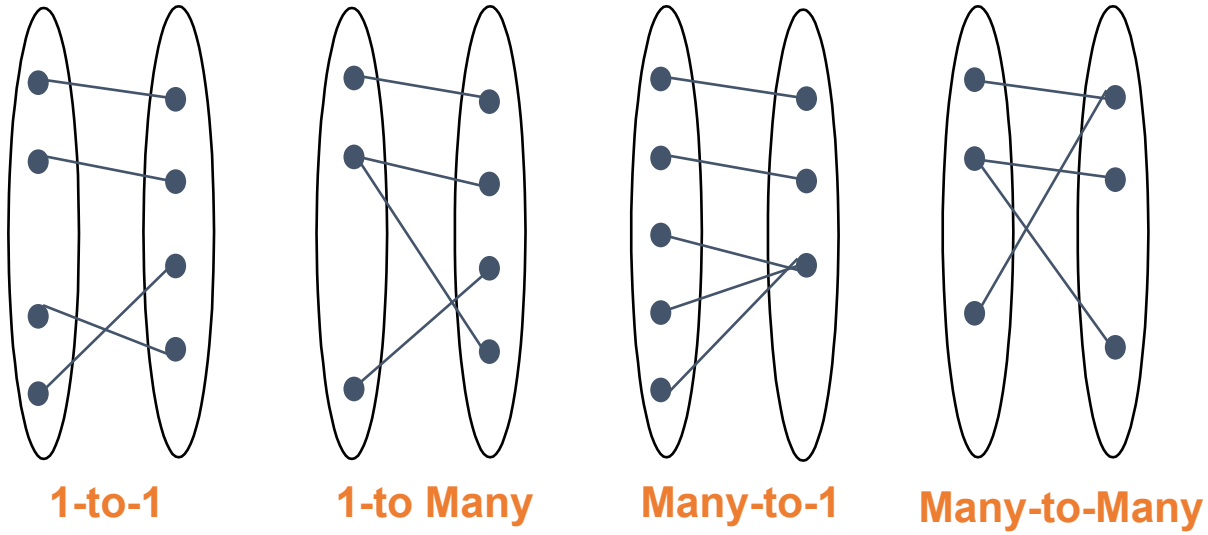
since	did	NIN
2021	3	8754702
2022	3	6820937
1992	3	2313927

did	dname	budget
1	Sales	75
3	Man.	545
2	Tech.	12



- Consider the works_in relationship
- If an employee can work in several departments and a department can have multiple employees
- What type of relationship is that?





How do we encode cardinality into ER diagrams?

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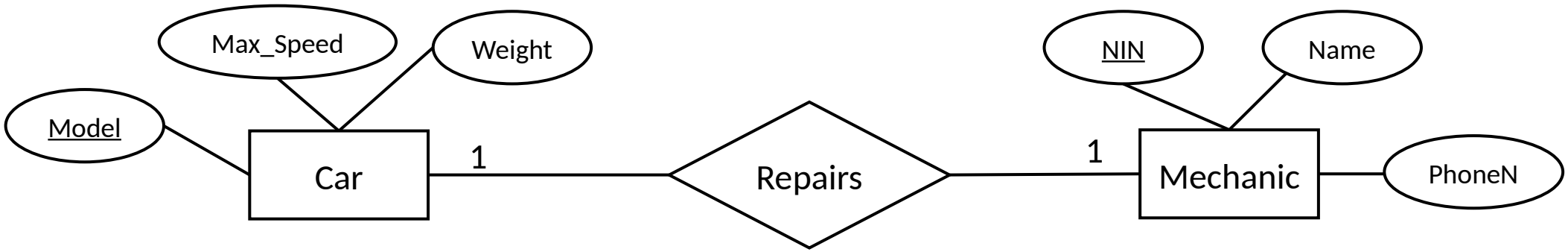
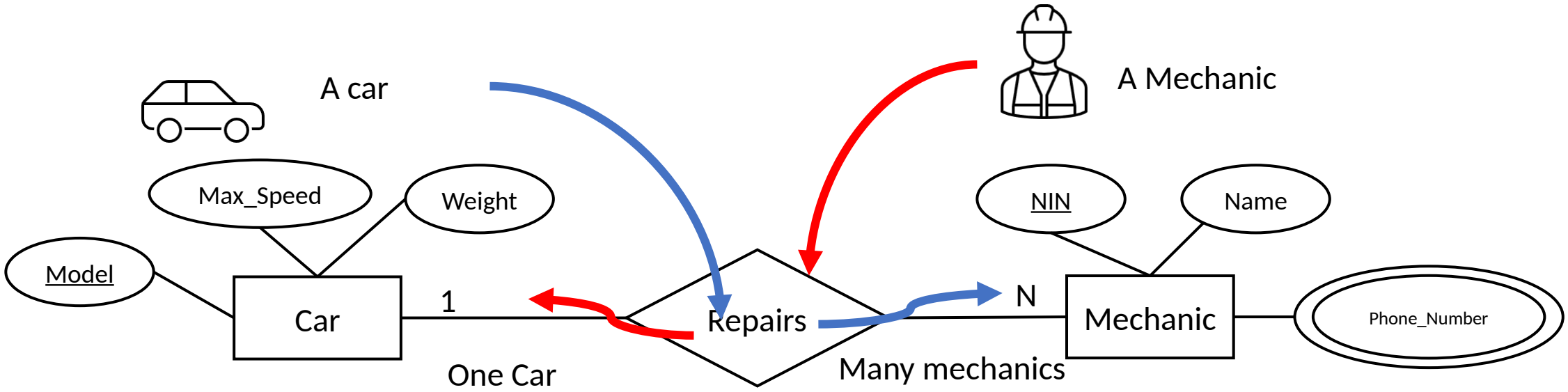
- We use **Chen's** notation (Always look at the opposite direction)
- 1:1 is for one-to-one
- 1:N is for one-to-many
- N:1 is for many-to-one
- N:M is for many-to-many.

1:1


Max_Speed
Weight
Model
Car
1
Repairs
1
NIN
Name
Mechanic
PhoneN

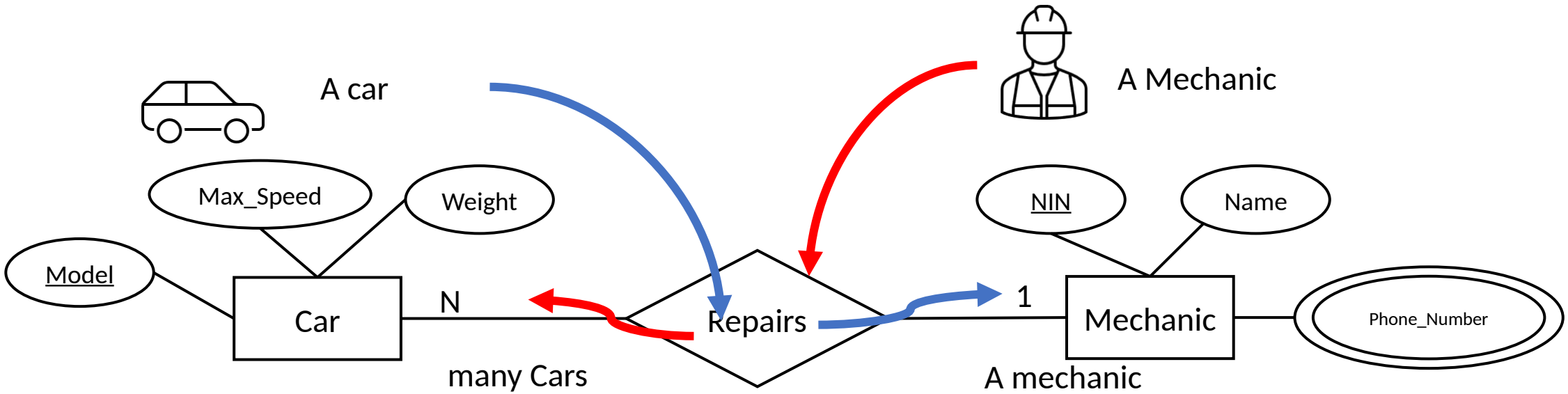

Car
Mechanic
SIMULATOR
2021

1:N One to many



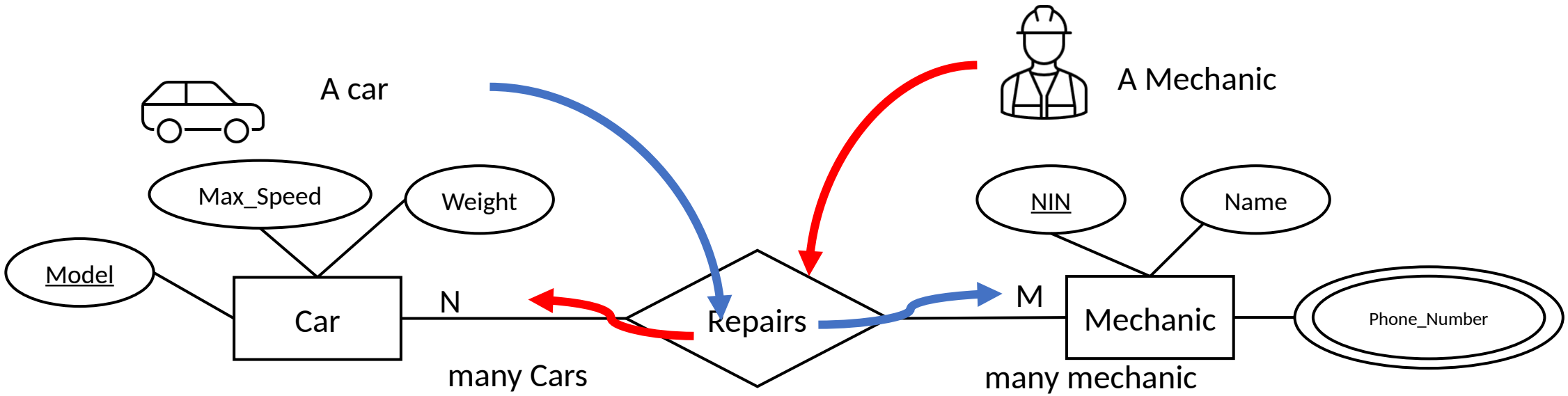
A car can be repaired by many mechanics.
A mechanic can repair one car.

N:1 Many to one



A car can be repaired by a mechanic.
A mechanic can repair many cars.

N:N many to many



A car can be repaired by many mechanics.
A mechanic can repair many cars.

Key concepts of ER: Participation Constraints.

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IMPORTANT CONTENT!!

Brand	Weight	Length	Max_Speed
BMW 3.21	1400	3.21	200
Toyota_Corolla	1300	3.18	200
Hyundai E.GLS	1400	3.16	210

NIN	Name	Phone_Number
87542702	Tom	75315567, 75315264
68201937	Uraz	75335521, 75334567
23139827	Nick	75315544, 75315237

Given an entity (E) from one entity set, what is the relation of this entity with the entities in the other entity sets?

Can more than one mechanic repair BMW 3.21?

Can Tom repair more than one type of car?

Can there be a mechanic who does not know how to repair a car?

Can there be a car that cannot be repaired?

Participation constraints

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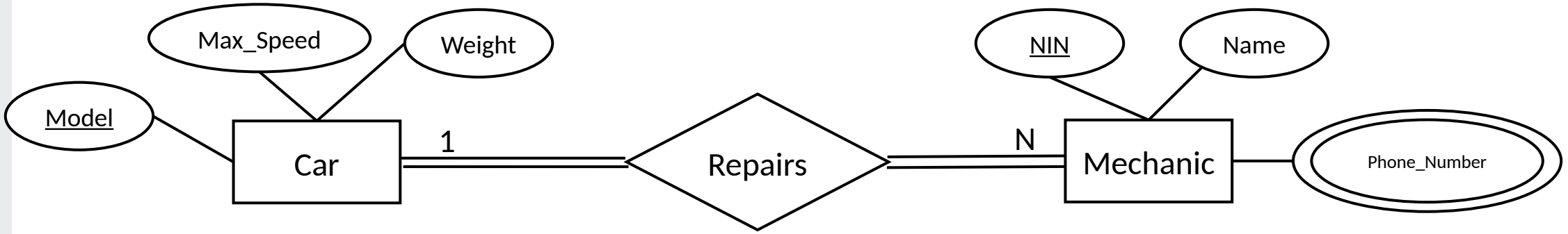
- Can there be a mechanic that cannot repair a car?
- If not, we need to state that there is a **Total Participation.**
  - Total Participation implies that if an entity exists in an entity set, it must relate with at least one entity in the other entity set.
  - A **double line** identifies total participation.

- If so, then it is **Partial Participation**
  - A **single line** identifies partial participation**.**

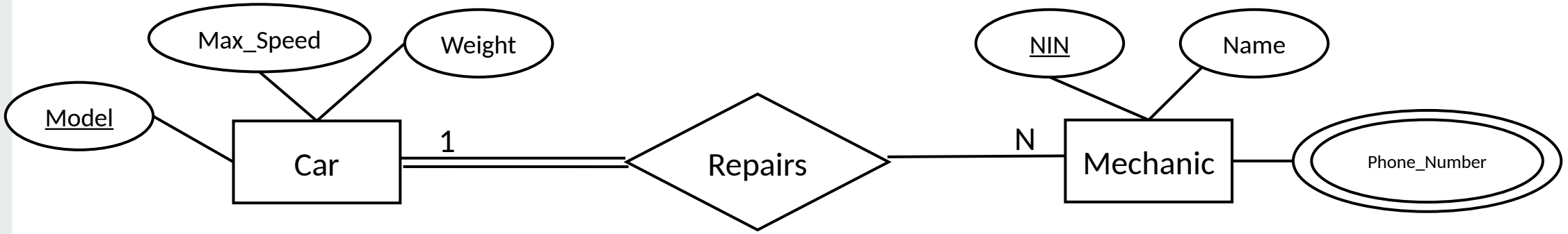
Participation constraints

- For each car, there **must be at least one** mechanic.
- Each mechanic must repair **exactly one** car.



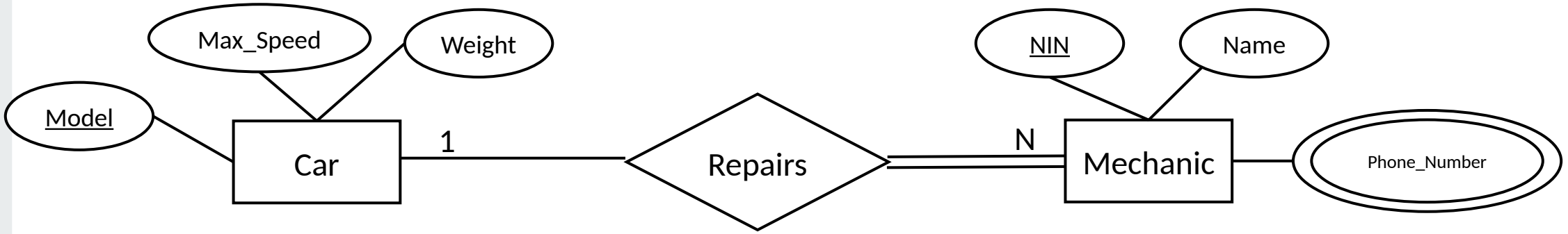
Participation constraints

- For each car, there must be at least one mechanic.
- Each mechanic repairs **at most** one car.



Participation constraints

- For each car, there **may be several mechanics**.
- Each mechanic must repair exactly one car.

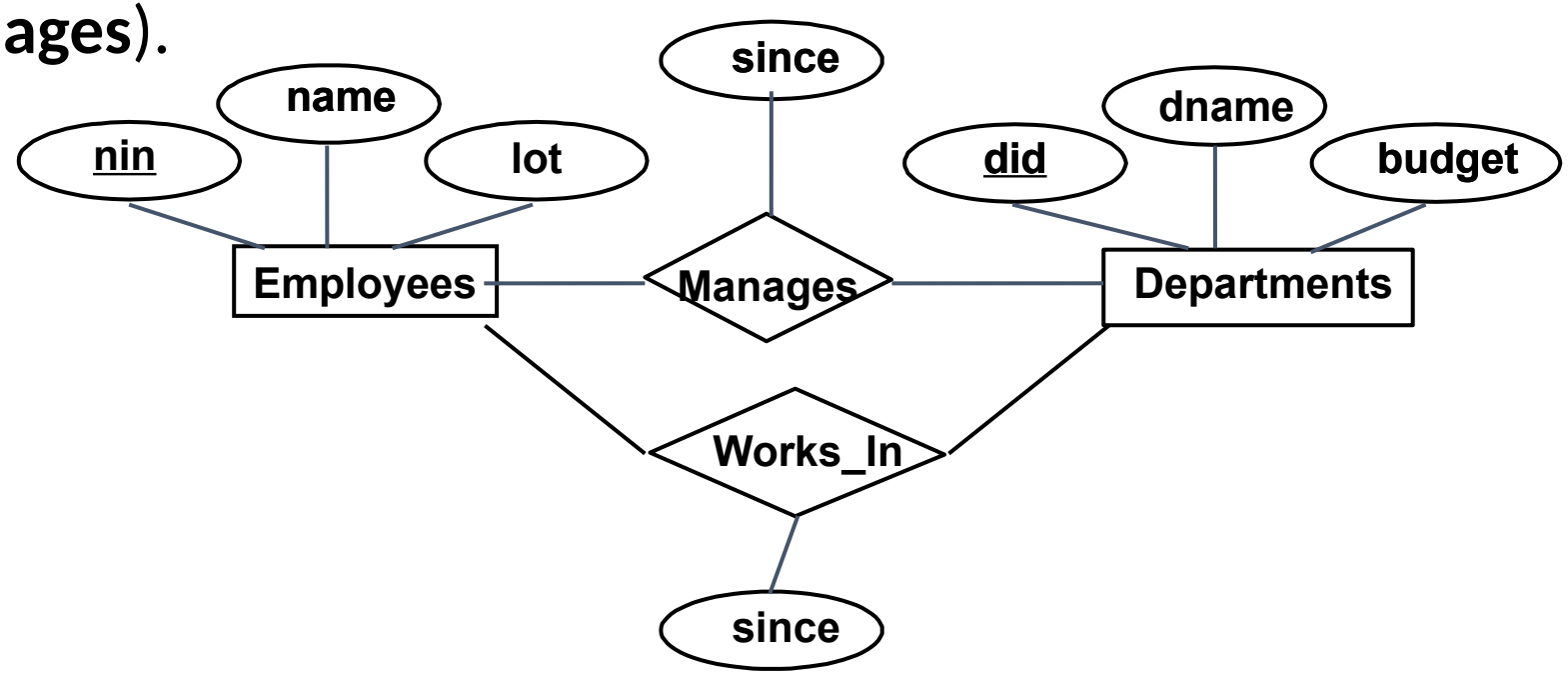


Exercise…

https://forms.office.com/e/5NcDL8BN86?origin=lprLink

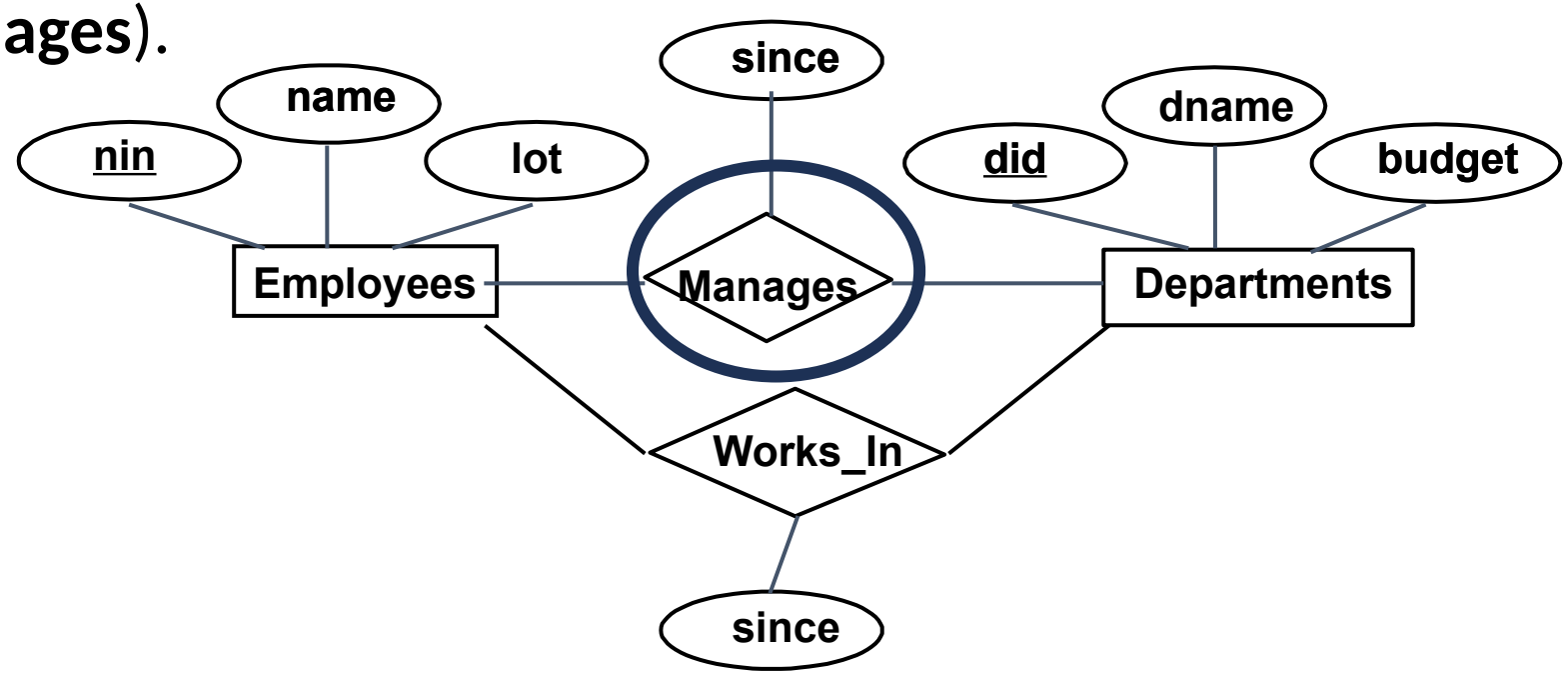
Let’s fill this.

- Consider the **cardinality** between Employees and Departments (**Manages**).



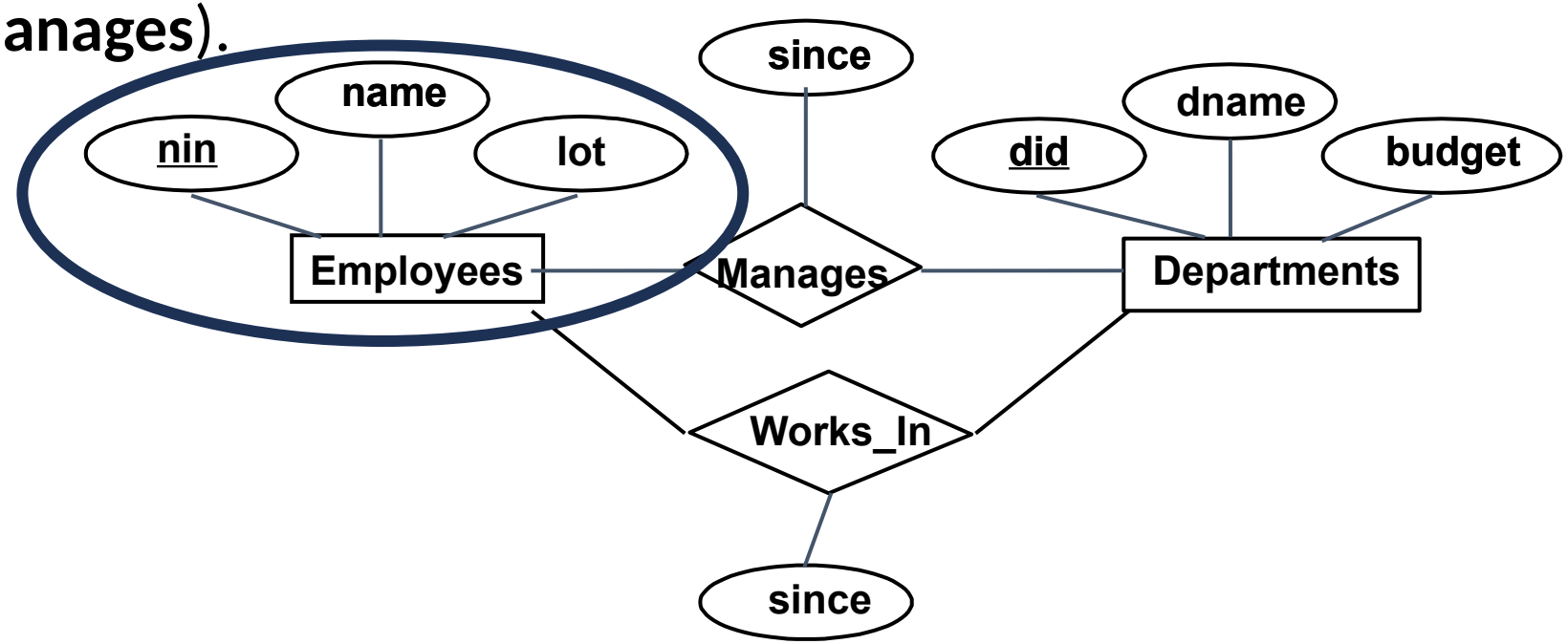
Let’s fill this.

- Consider the **cardinality** between Employees and Departments (**Manages**).



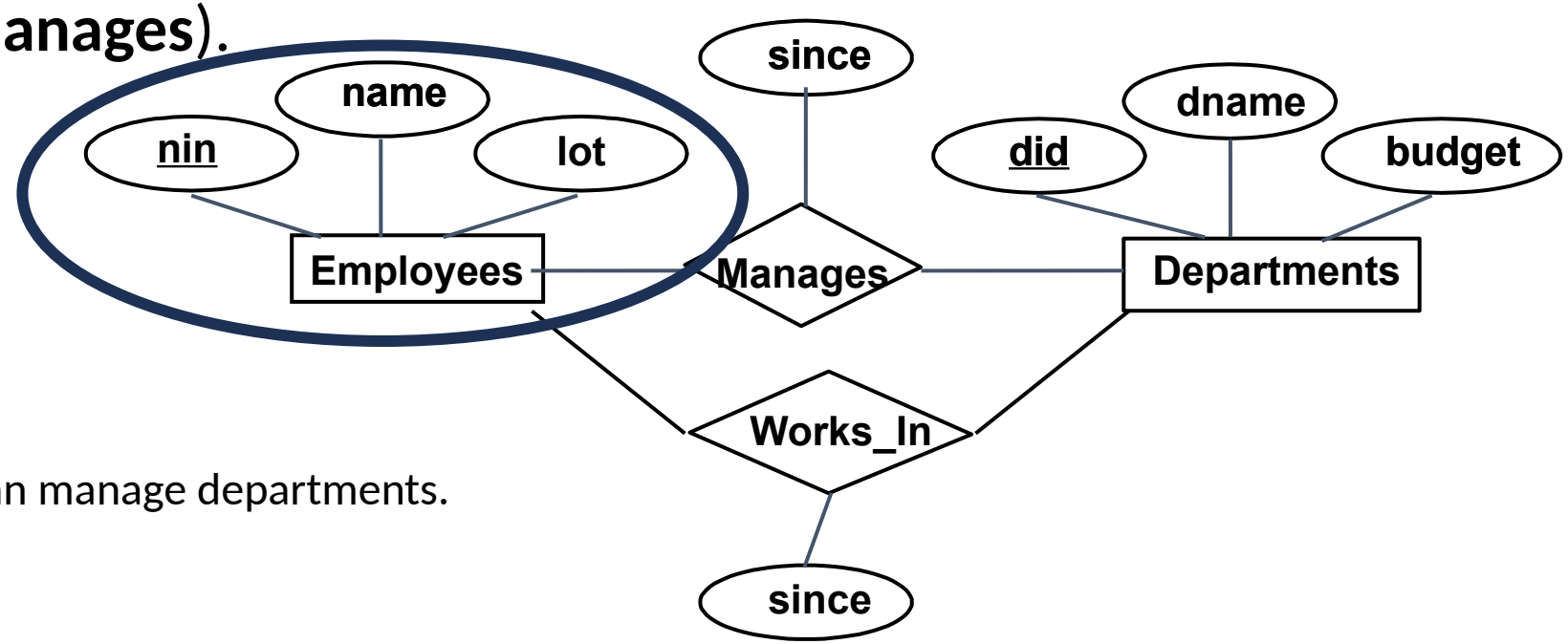
Let’s fill this.

- Consider the **cardinality** between Employees and Departments (**Manages**).



Let’s fill this.

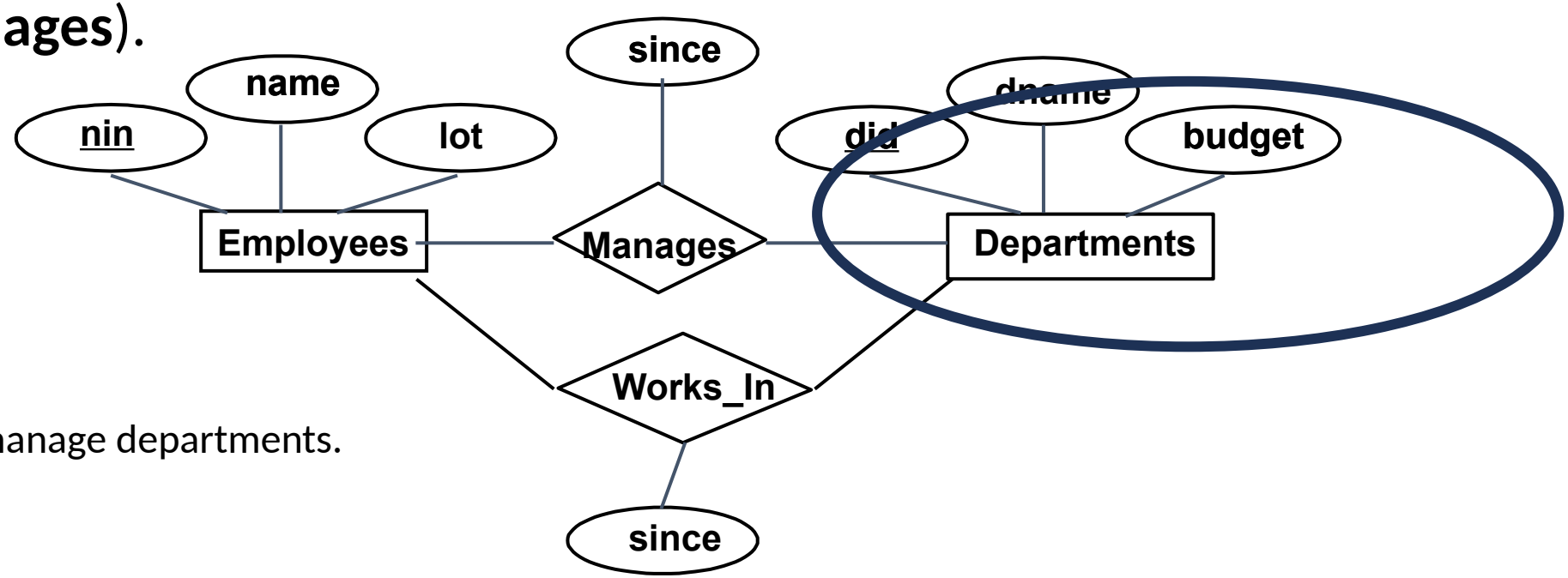
- Consider the **cardinality** between Employees and Departments (**Manages**).



An employee can manage departments.

Let’s fill this.

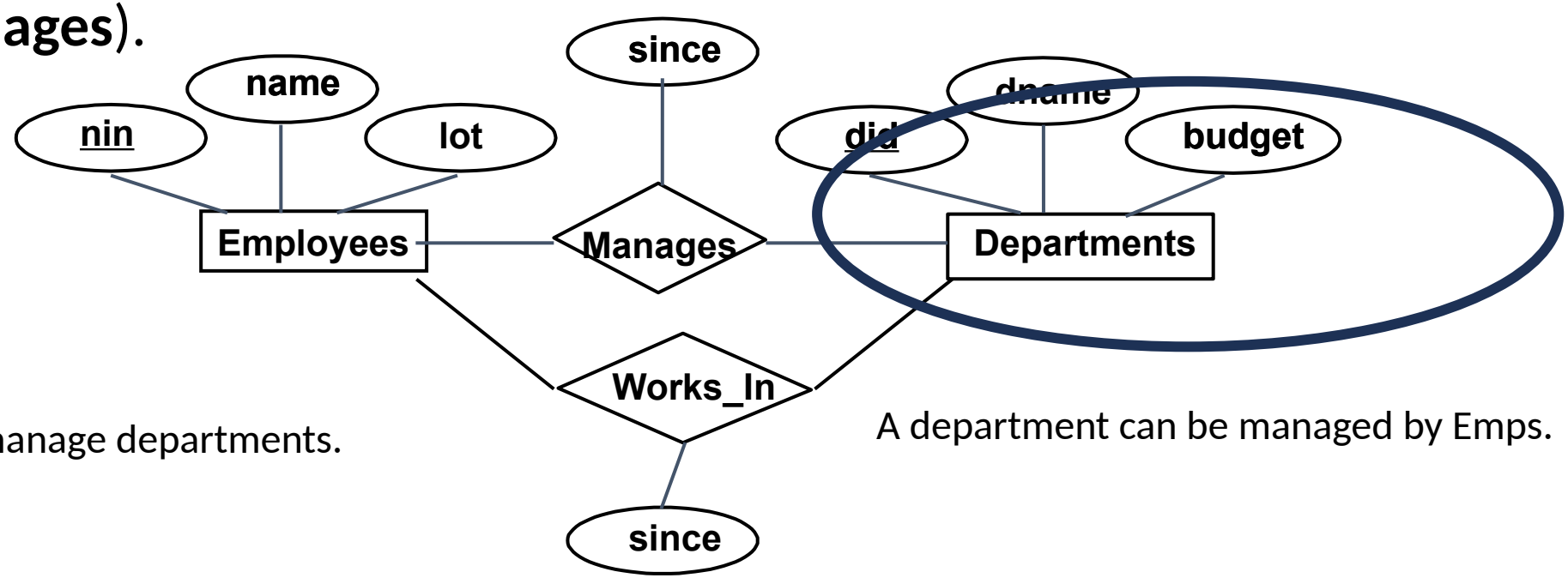
- Consider the **cardinality** between Employees and Departments (**Manages**).



An employee can manage departments.

Let's fill this.

- Consider the **cardinality** between Employees and Departments (**Manages**).

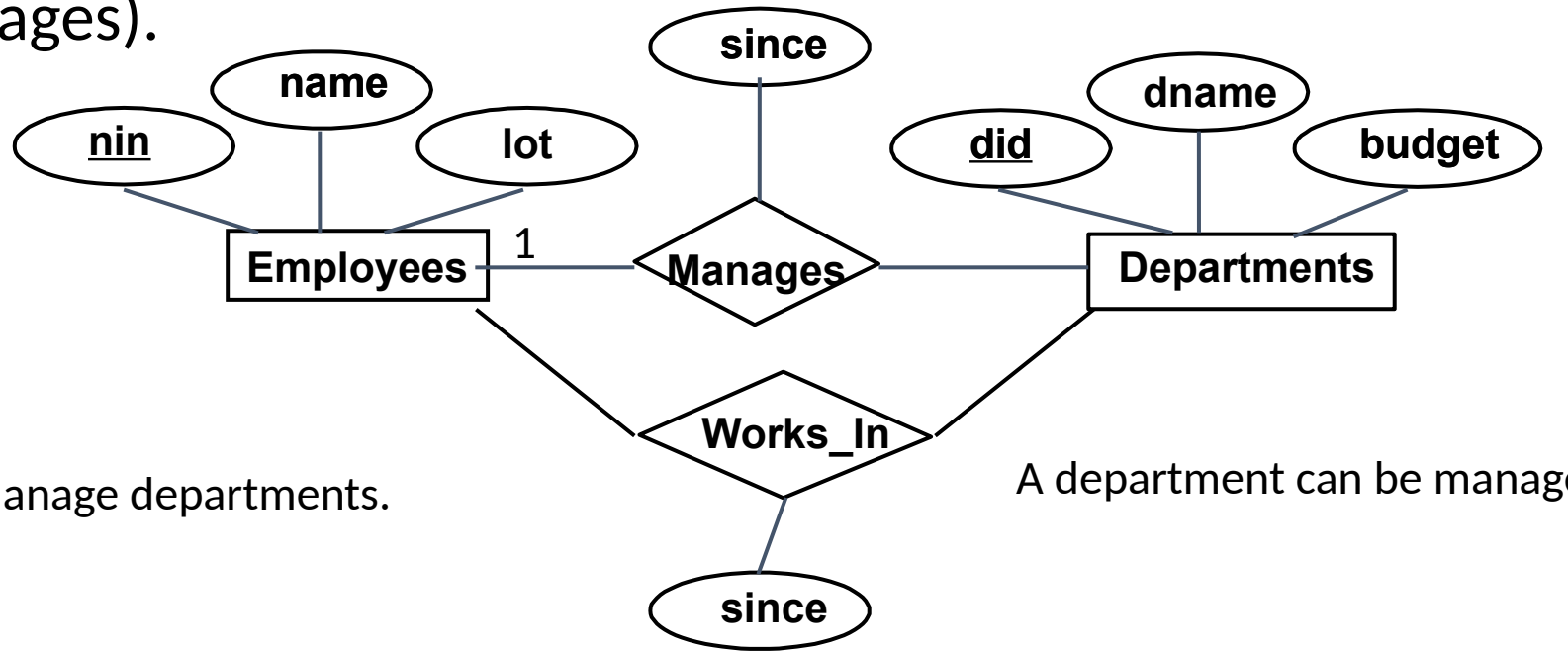


An employee can manage departments.

A department can be managed by Emps.

Let's fill this.

- Consider the **cardinality** between Employees and Departments (Manages).

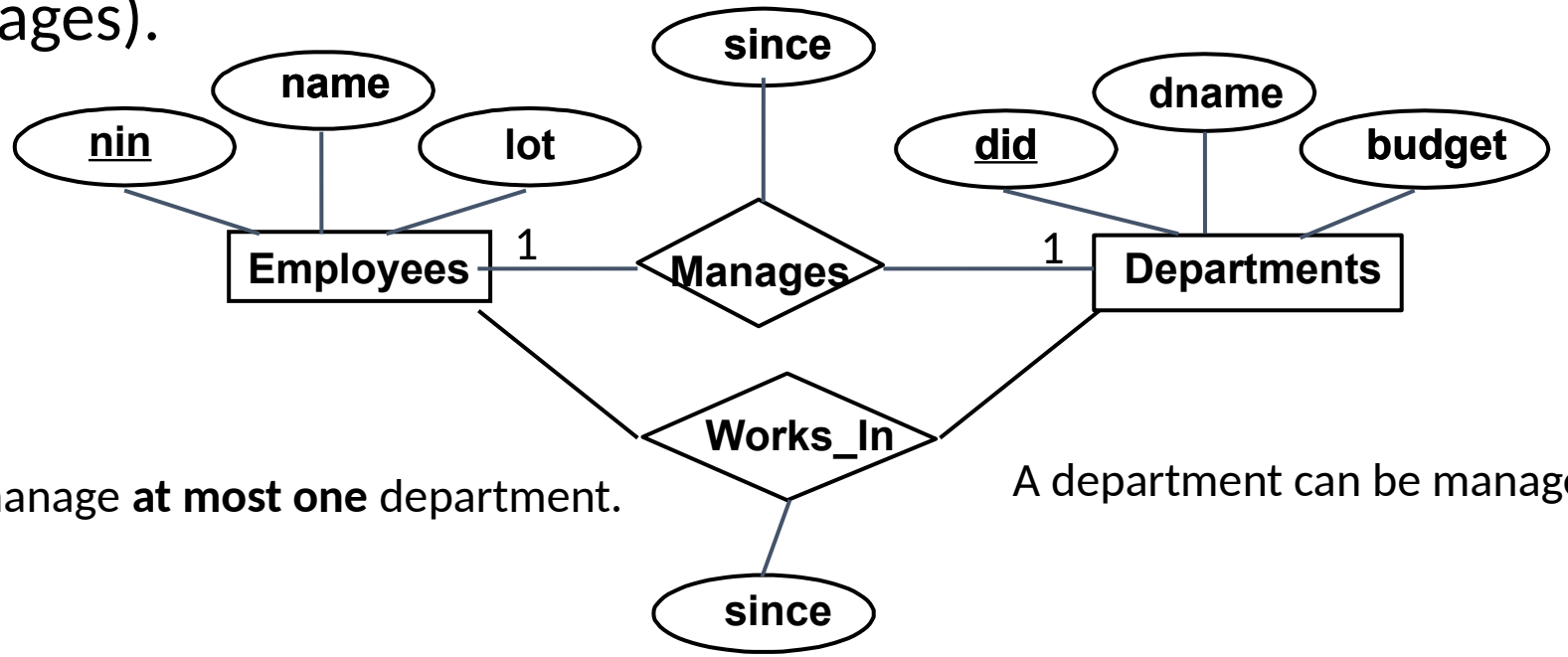


An employee can manage departments.

A department can be managed by **at most one** Emp.

Let's fill this.

- Consider the **cardinality** between Employees and Departments (Manages).

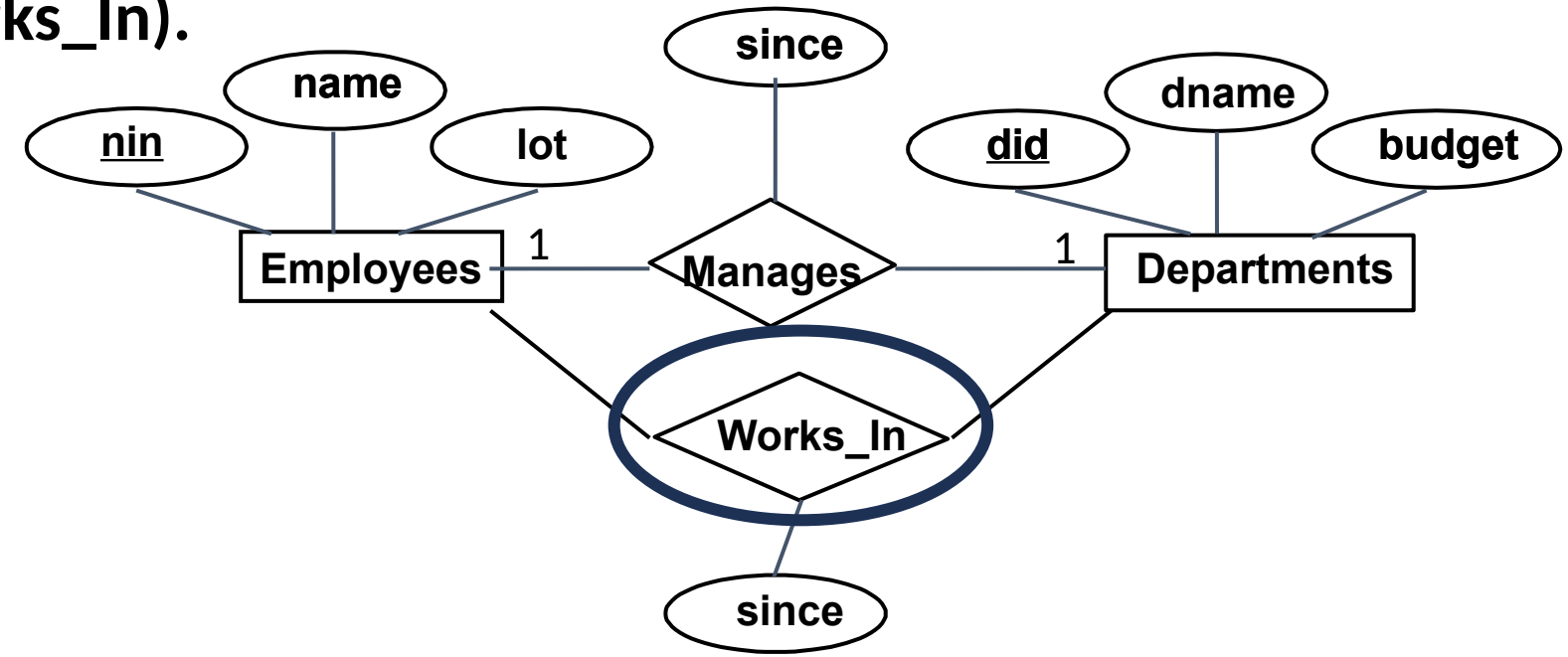


An employee can manage **at most one** department.

A department can be managed by zero or one Emps.

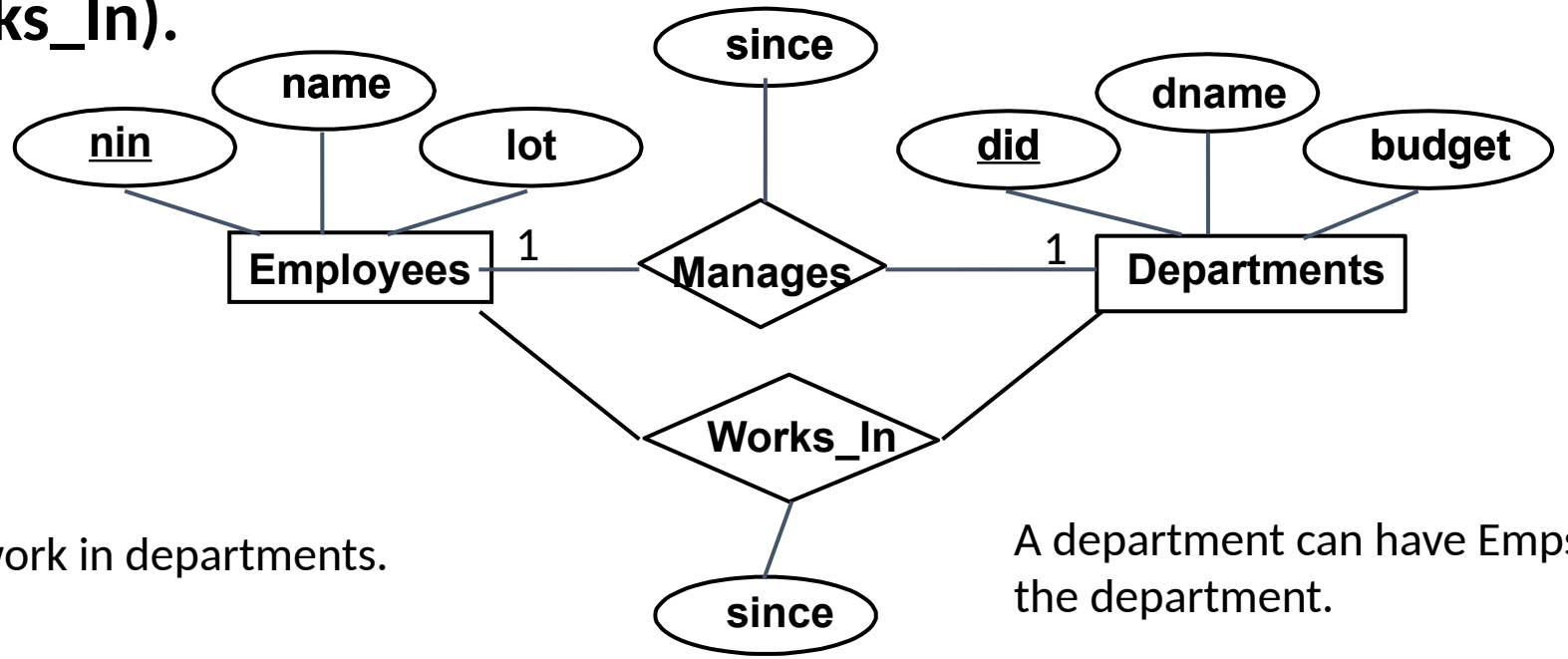
Let’s fill this.

- Consider the **cardinality** between Employees and Departments **(Works_In).**



Let’s fill this.

- Consider the **cardinality** between Employees and Departments **(Works_In).**

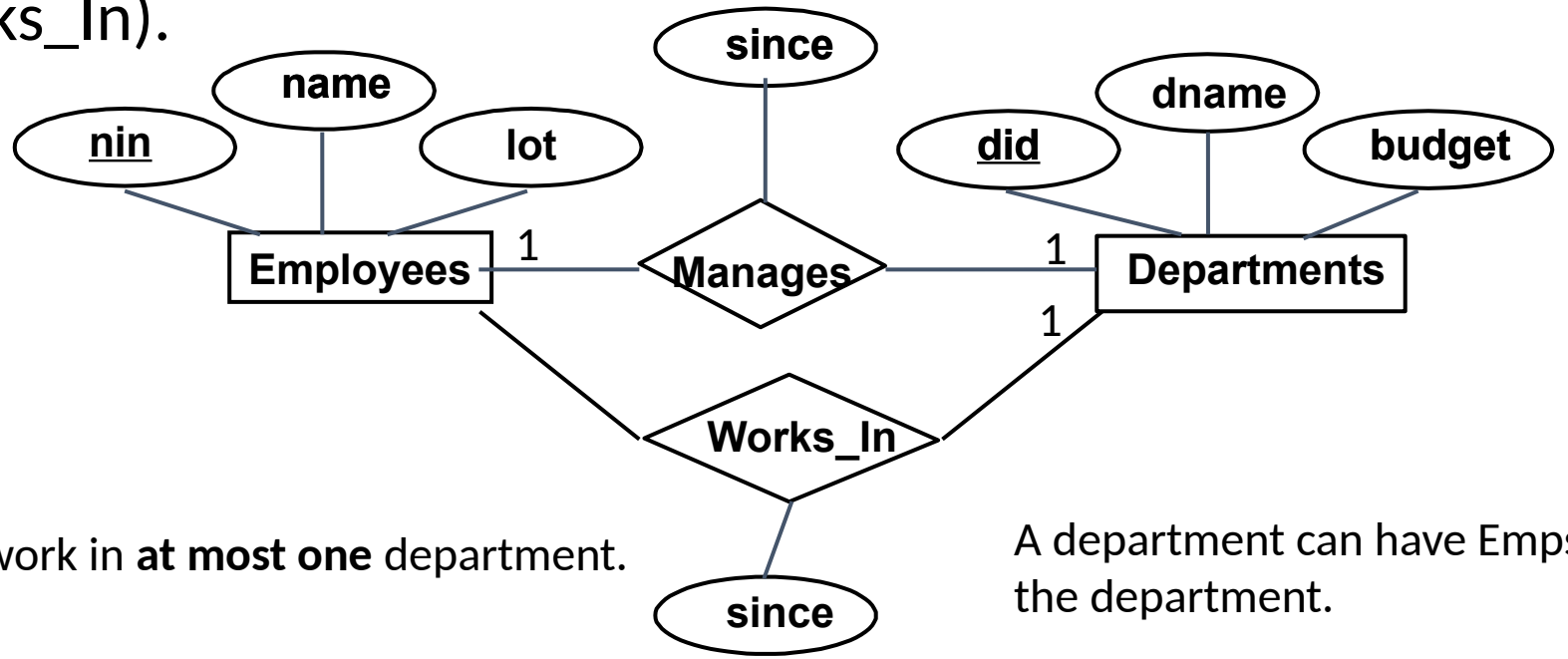


An employee can work in departments.

A department can have Emps. working in the department.

Let's fill this.

- Consider the **cardinality** between Employees and Departments (Works_In).

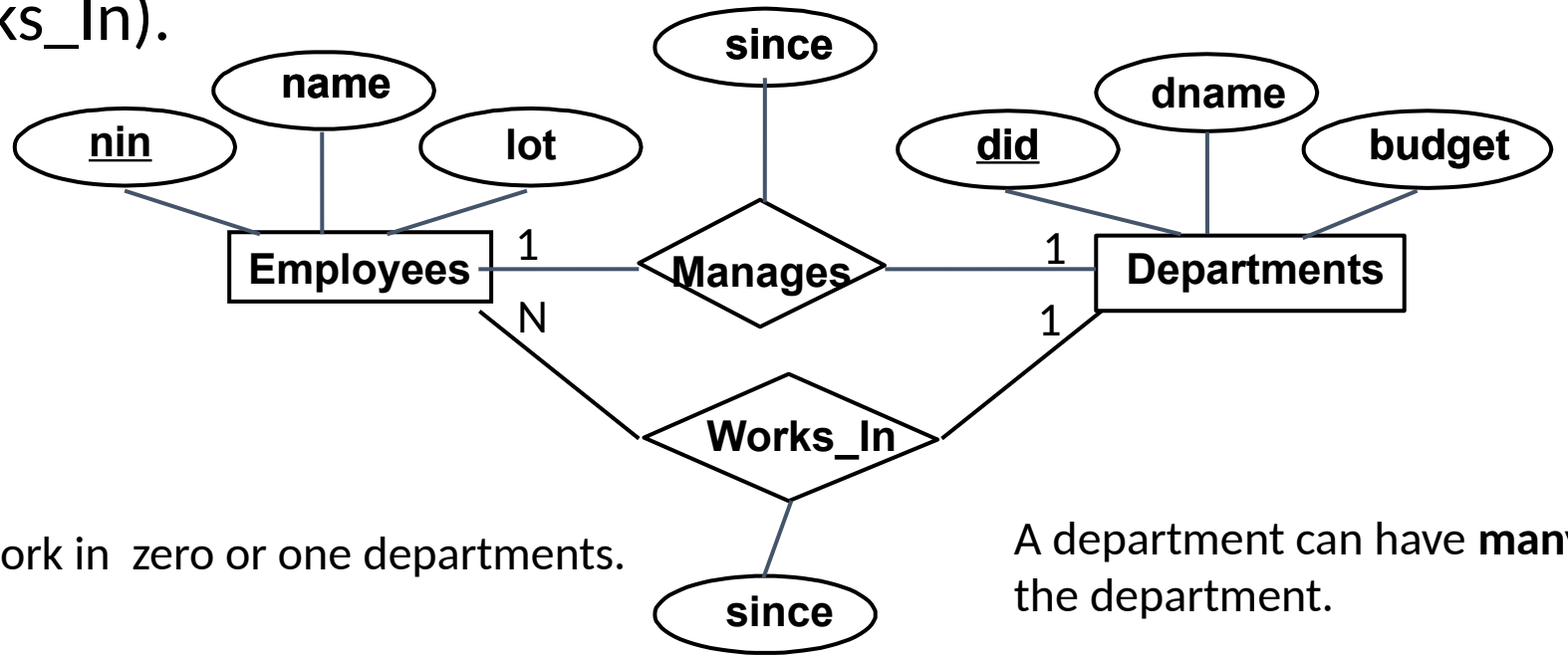


An employee can work in **at most one** department.

A department can have Emps. working in the department.

Let's fill this.

- Consider the **cardinality** between Employees and Departments (Works_In).

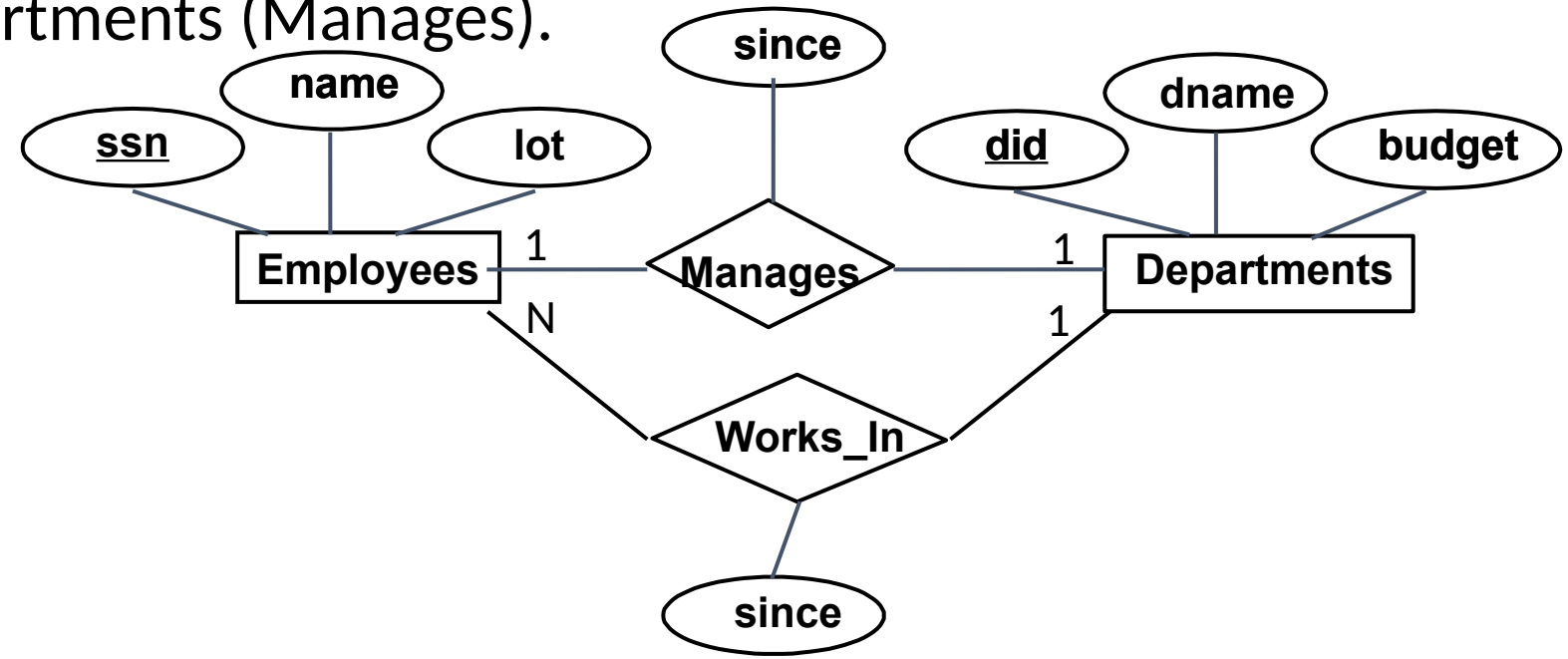


An employee can work in zero or one departments.

A department can have **many** Emps. working in the department.

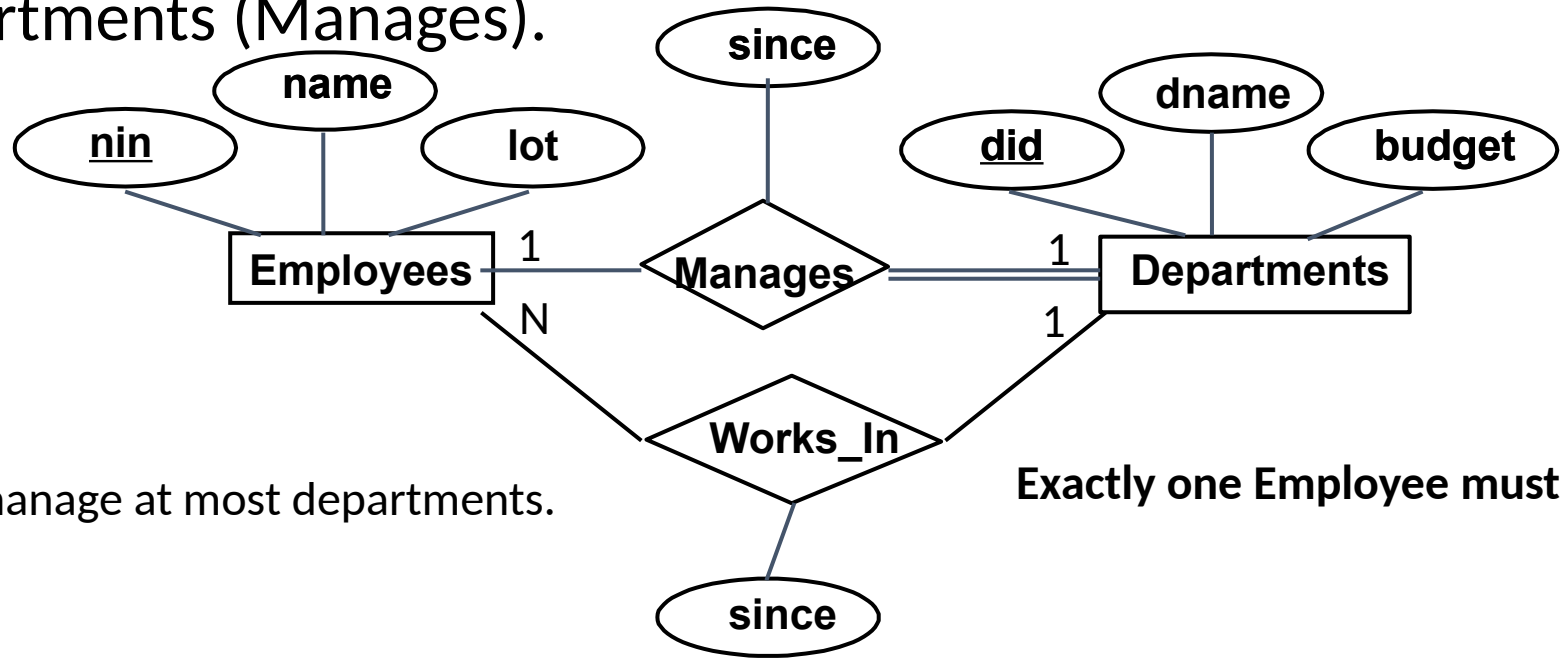
Let’s fill this.

- Consider the **participation constraints** between Employees and Departments (Manages).



Let's fill this.

- Consider the **participation constraints** between Employees and Departments (Manages).

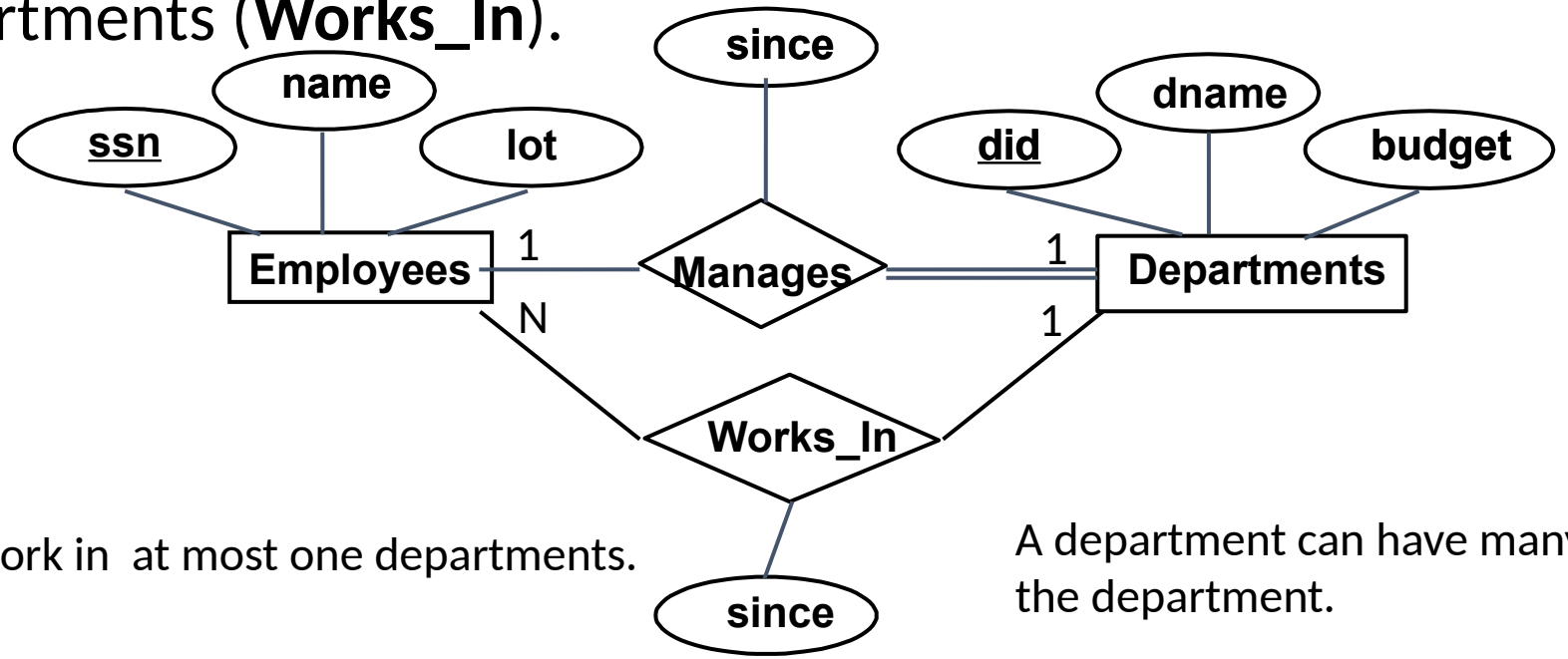


An employee can manage at most departments.

Exactly one Employee must manage a department.

Let’s fill this.

- Consider the **participation constraints** between Employees and Departments (**Works_In**).

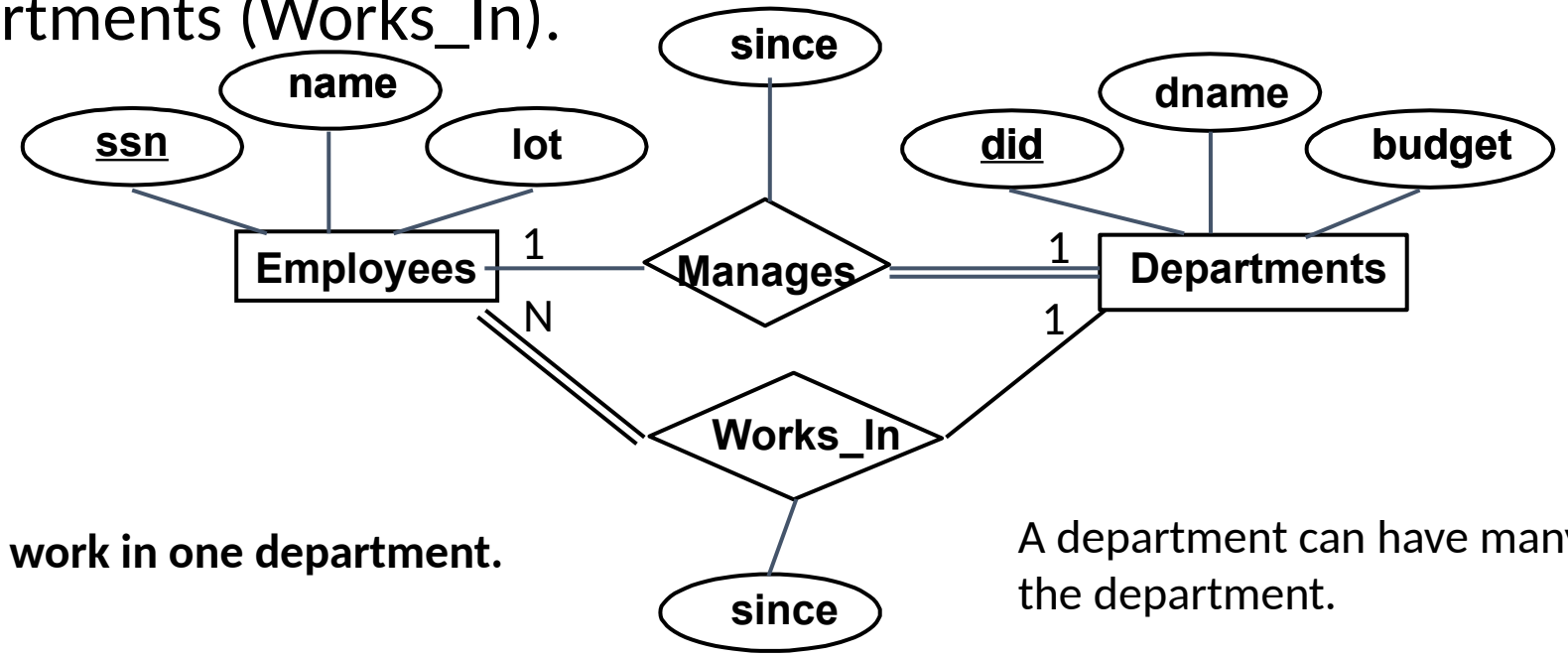


An employee can work in at most one departments.

A department can have many Emps. working in the department.

Let’s fill this.

- Consider the **participation constraints** between Employees and Departments (Works_In).

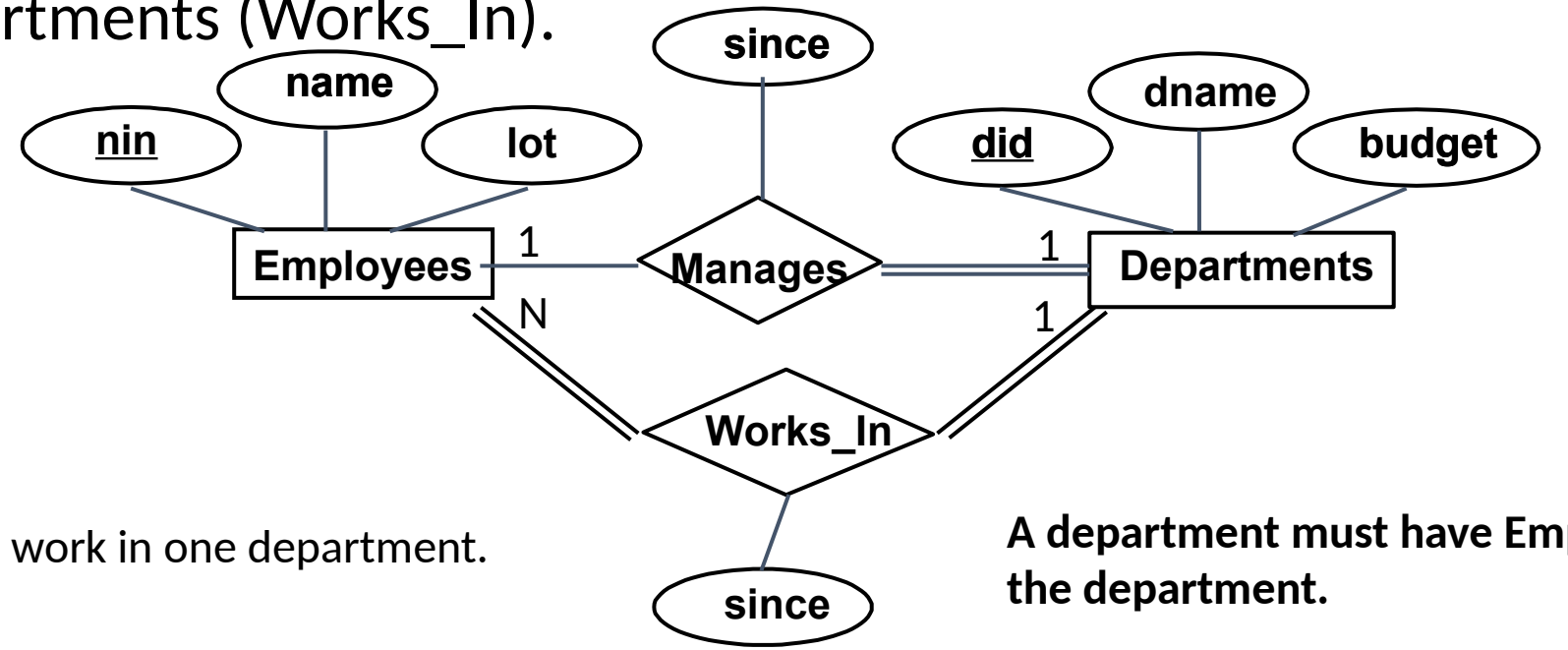


An employee must work in one department.

A department can have many Emps. working in the department.

Let's fill this.

- Consider the **participation constraints** between Employees and Departments (Works_In).

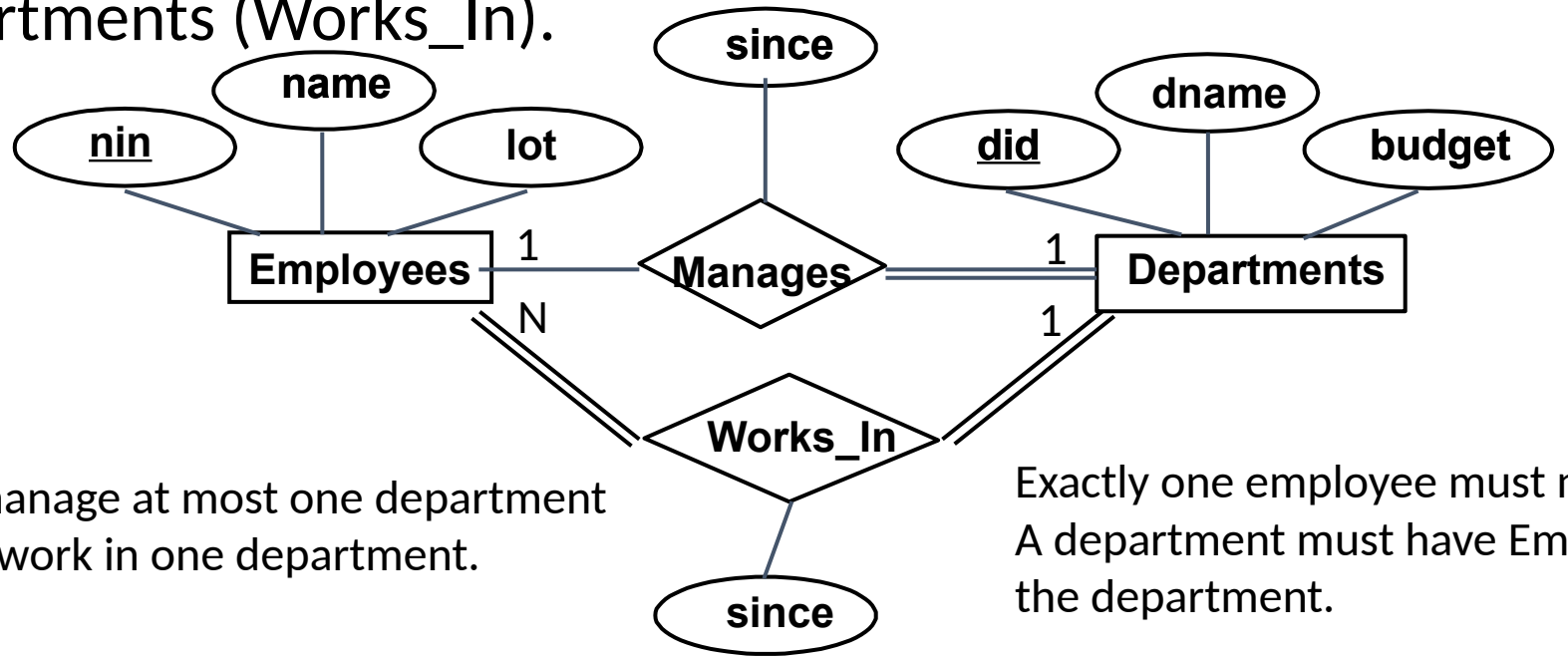


An employee must work in one department.

A department must have Emps. working in the department.

Let's fill this.

- Consider the **participation constraints** between Employees and Departments (Works_In).

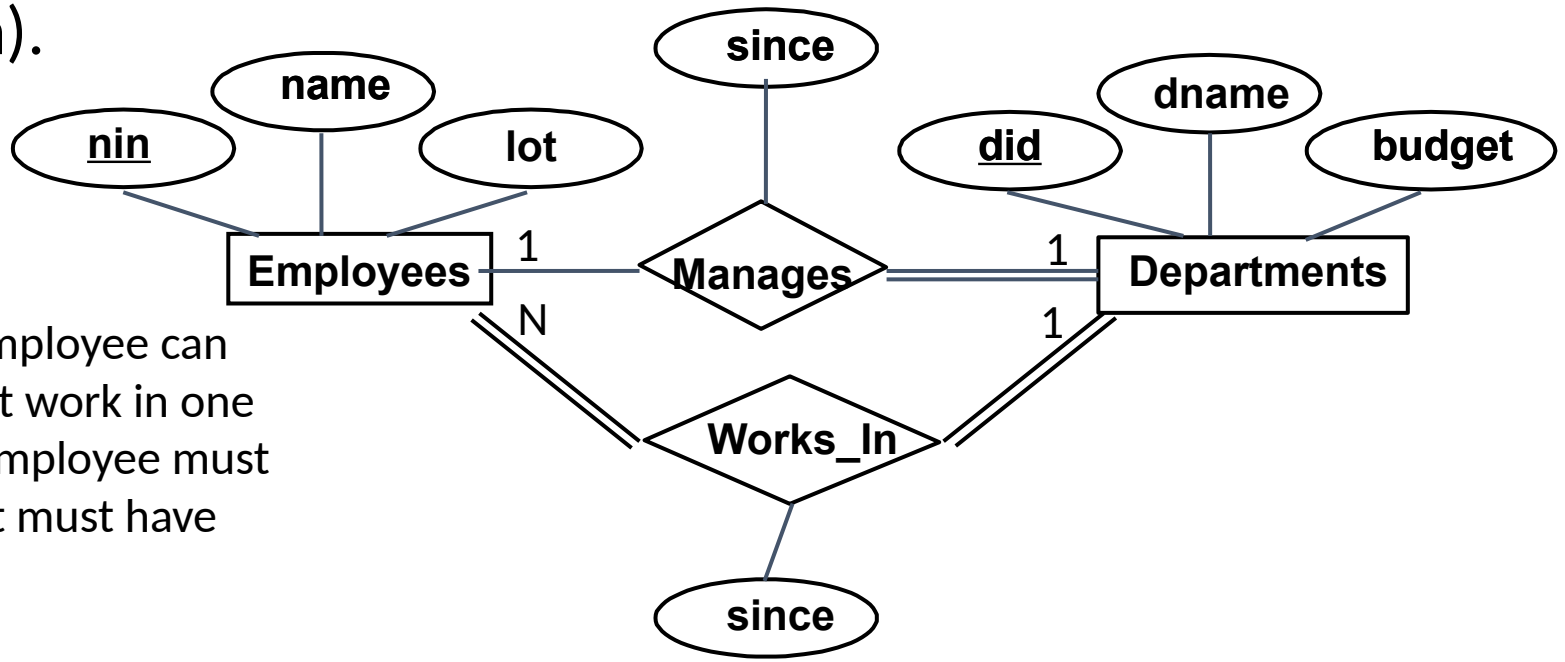


An employee can manage at most one department
An employee must work in one department.

Exactly one employee must manage a department.
A department must have Emps. working in the department.

Let’s fill this.

- Consider the **participation constraints** between Employees and Departments (Works_In).



“Please draw an ER diagram where an employee can manage at most one department or must work in one department providing that exactly one employee must manage a department and a department must have Emps. working in the department.”

Weak entity and weak relation sets.

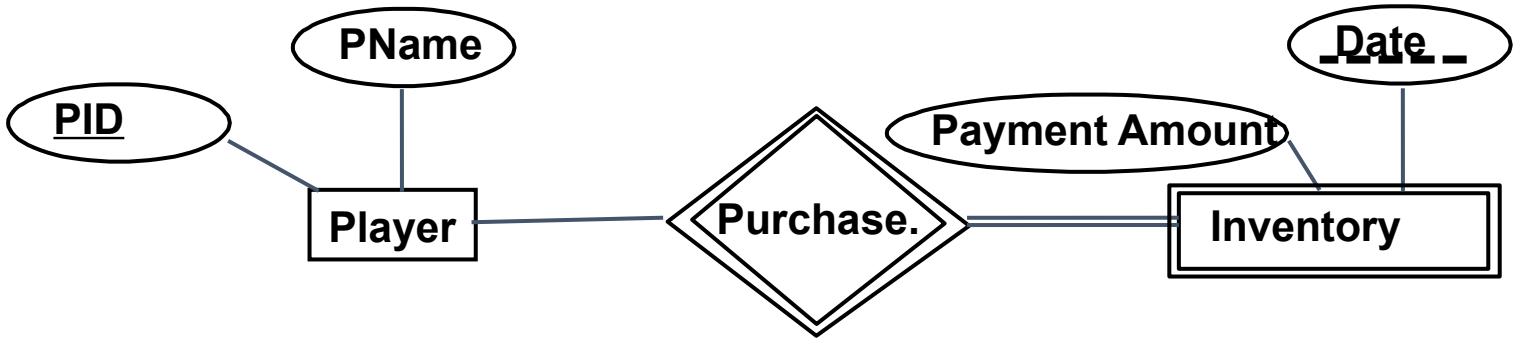
Consider the following case.

A player makes in-game equipment (armour, ammunition, etc) purchases using imaginary money (coins). The game server has to keep the information as long as the player plays the game.

Assume we do not want to keep the purchase information when the player deletes their account, and we want to automate this deletion operation.

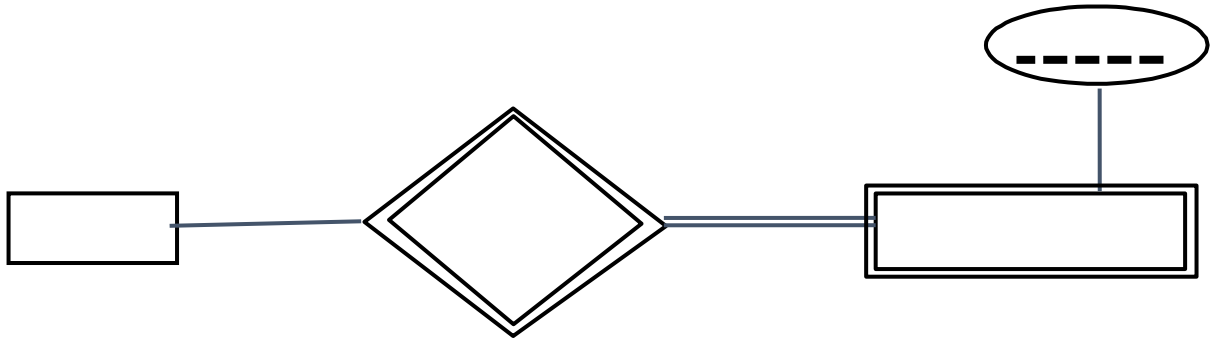
The DBMS automatically remove all the redundant purchase **data from the tables.**

We use Weak-Entity and Relation sets to represent this.



Weak Entity-Relation Sets

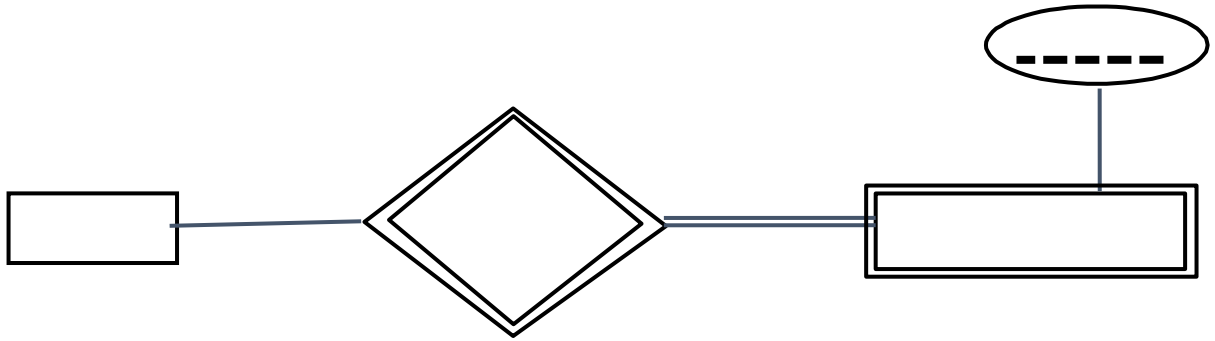
Represented by a **double-lined diamond**, a **double-lined rectangle** connected by double lines. The weak key attribute is represented by a dashed underline.



Weak Entity-Relation Sets

Represented by a **double-lined diamond**, a **double-lined rectangle** connected by double lines. The weak key attribute is represented by a dashed underline.

The double-lined rectangle is the **subject**, the single-lined rectangle is the **owner**.

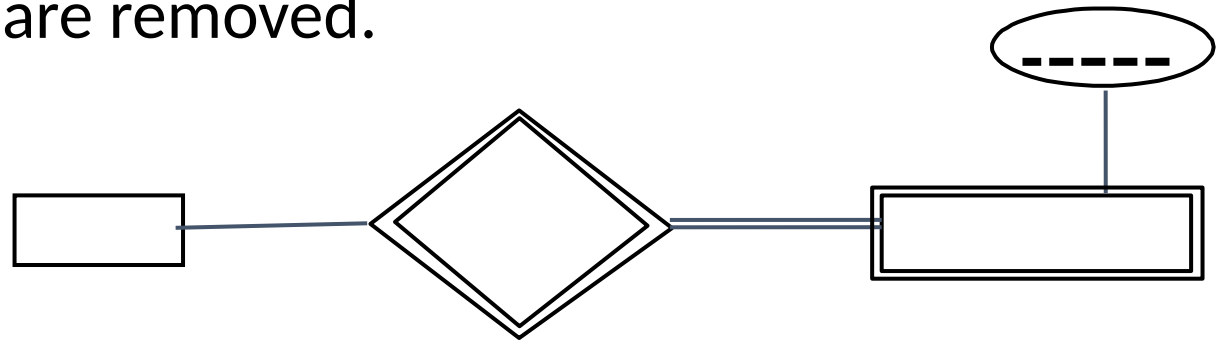


Weak Entity-Relation Sets

Represented by a **double-lined diamond**, a **double-lined rectangle** connected by double lines. The weak key attribute is represented by a dashed underline.

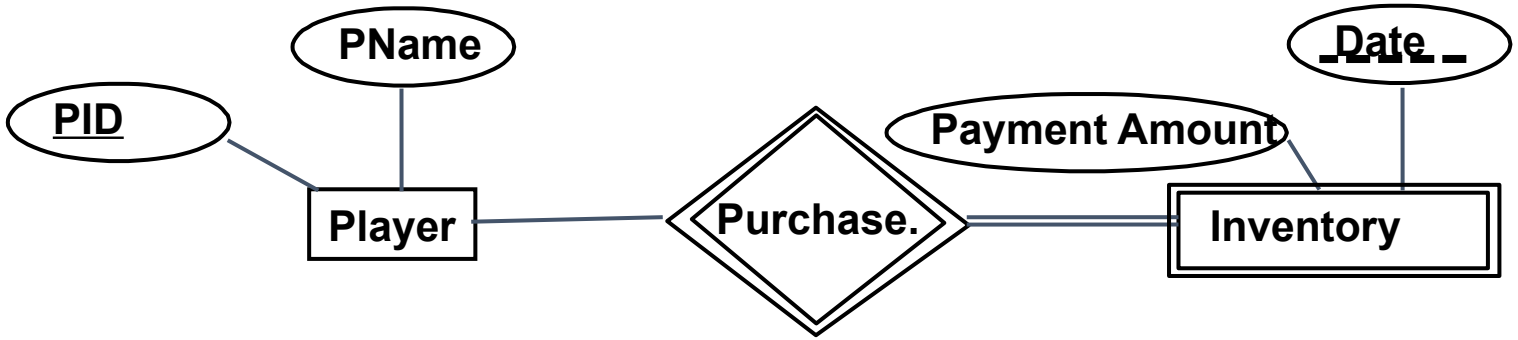
The double-lined rectangle is the **subject**, the single-lined rectangle is the **owner**.

When an entity in the owner table is removed, all the related entries in the subject table are removed.



Weak entity set and weak relation sets.

- Weak Entity sets do not possess a Primary Key; they **possess a Weak Key.**
- The primary key of the Owner table and the Weak Key of the Subject table constitutes a key for the Subject Table. (PID, Data is a key for Inventory)



PName	PID
Alex	1
Mark	2
Claudia	3
Summer	4

Payment Amount	Date
1121	01/04/1982
12312	01/04/1982
1121	01/04/1958
1121	10/02/1994

Massively multiplayer online role-playing game

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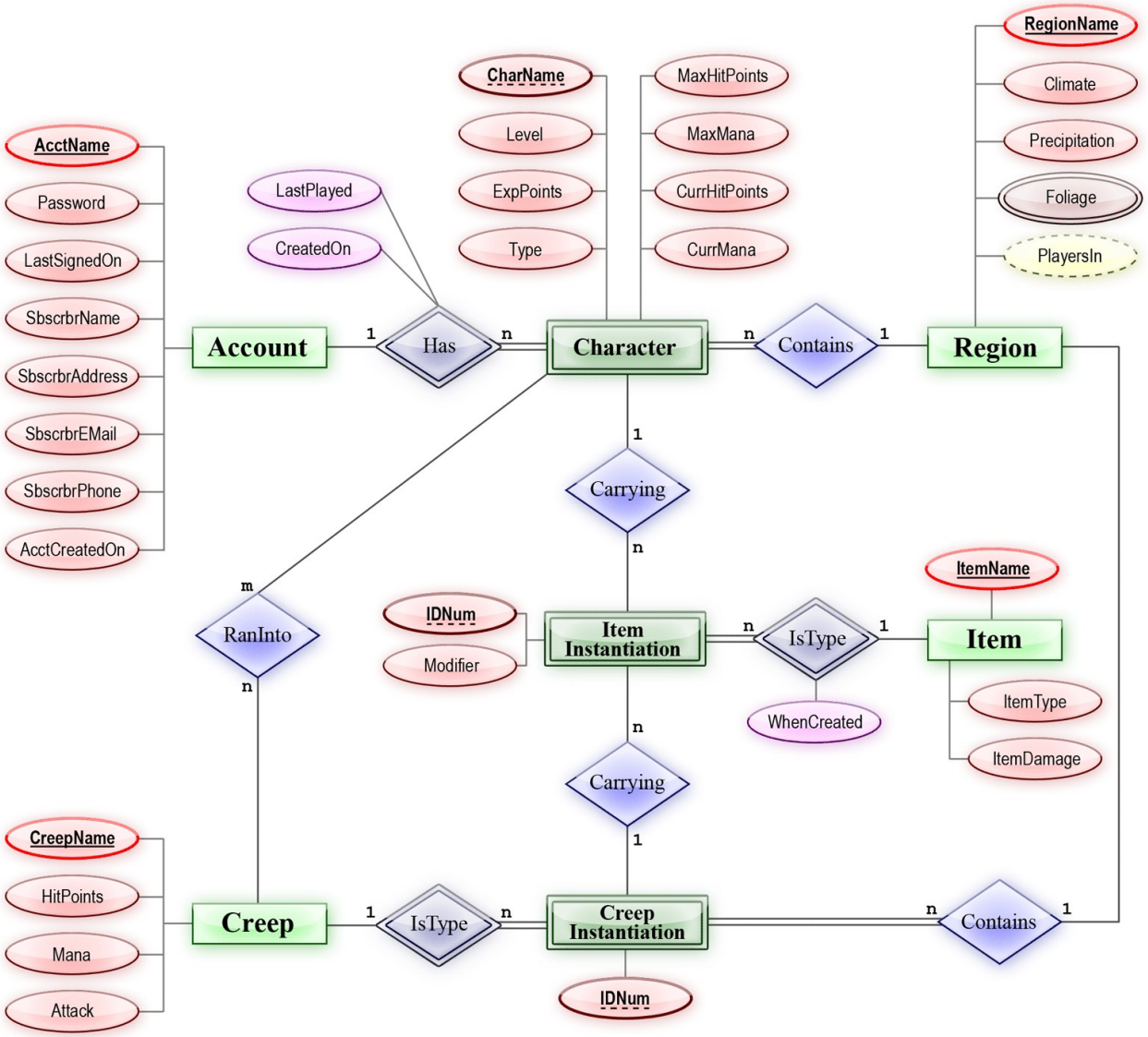
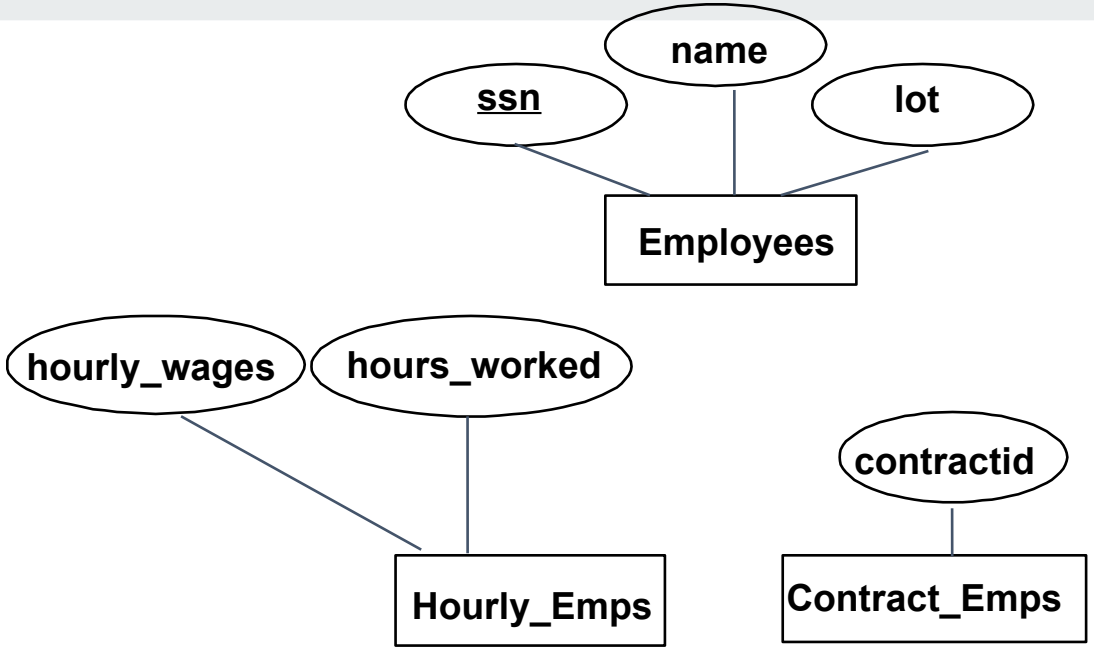
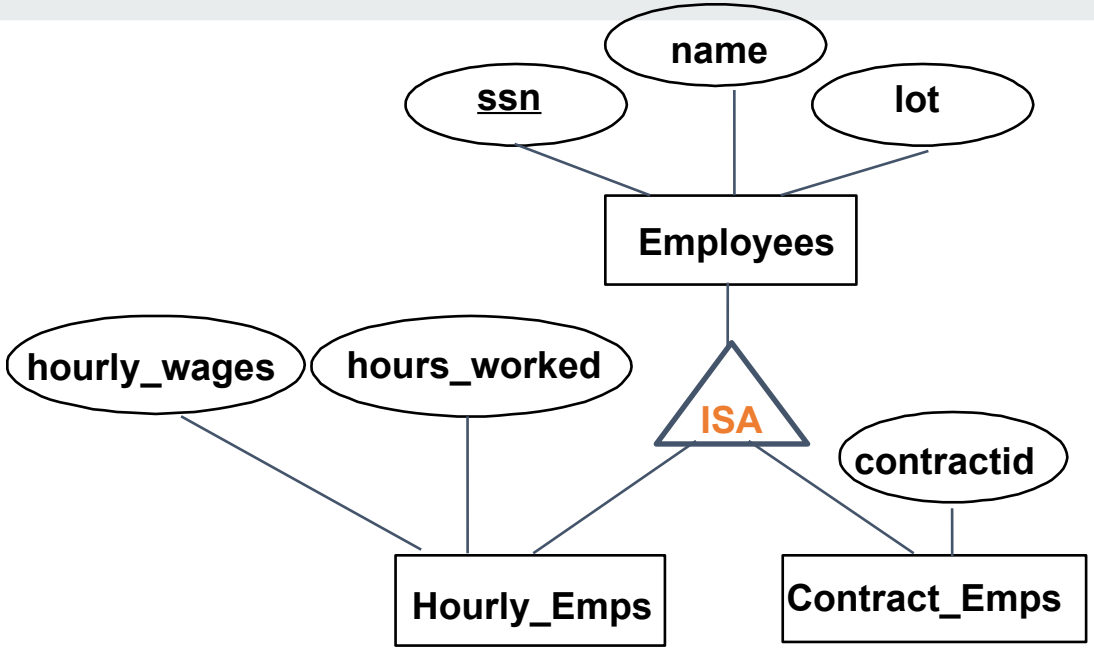


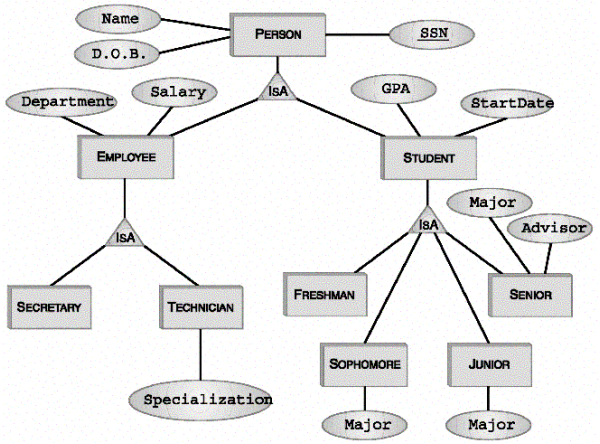
Extended ER
ISA (`is a') Hierarchies

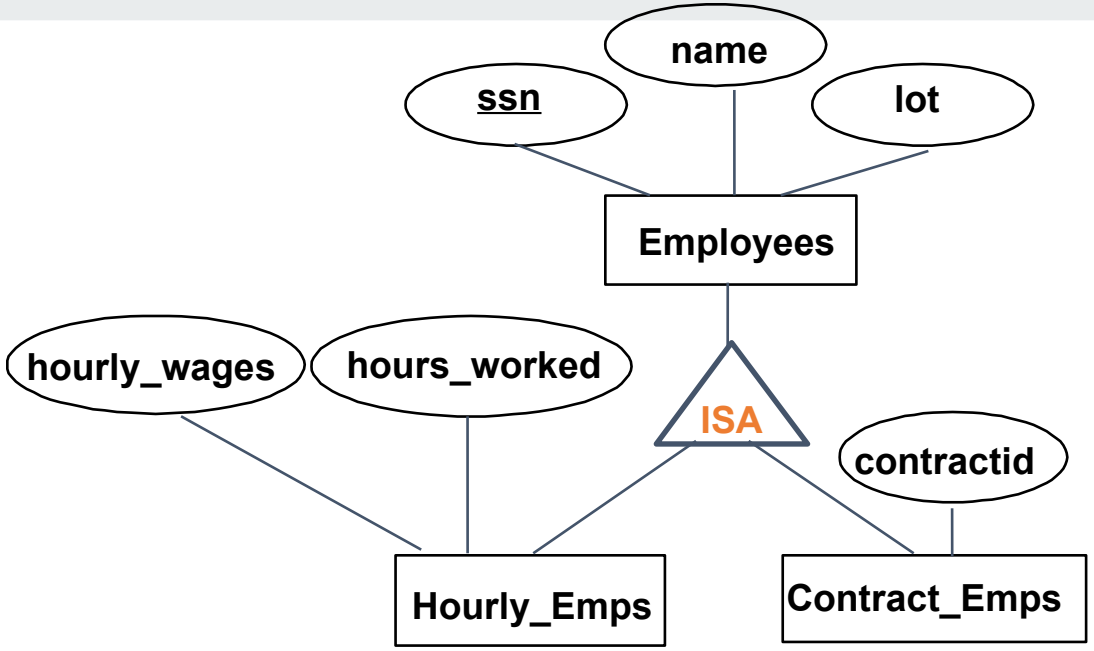


Extended ER
ISA (`is a') Hierarchies



Extended ER
ISA (`is a') Hierarchies





- *Overlap constraints*: Can Uraz be an Hourly Employee as well as a Contract Employee?
- *Covering constraints*: Does every Employee also have to be an Hourly Employee or a Contract Employee?
- Reasons for using ISA:
  - To add descriptive attributes specific to a subclass.
  - To identify entities that participate in a relationship.

Recall: please use the symbolism we use in the lectures.

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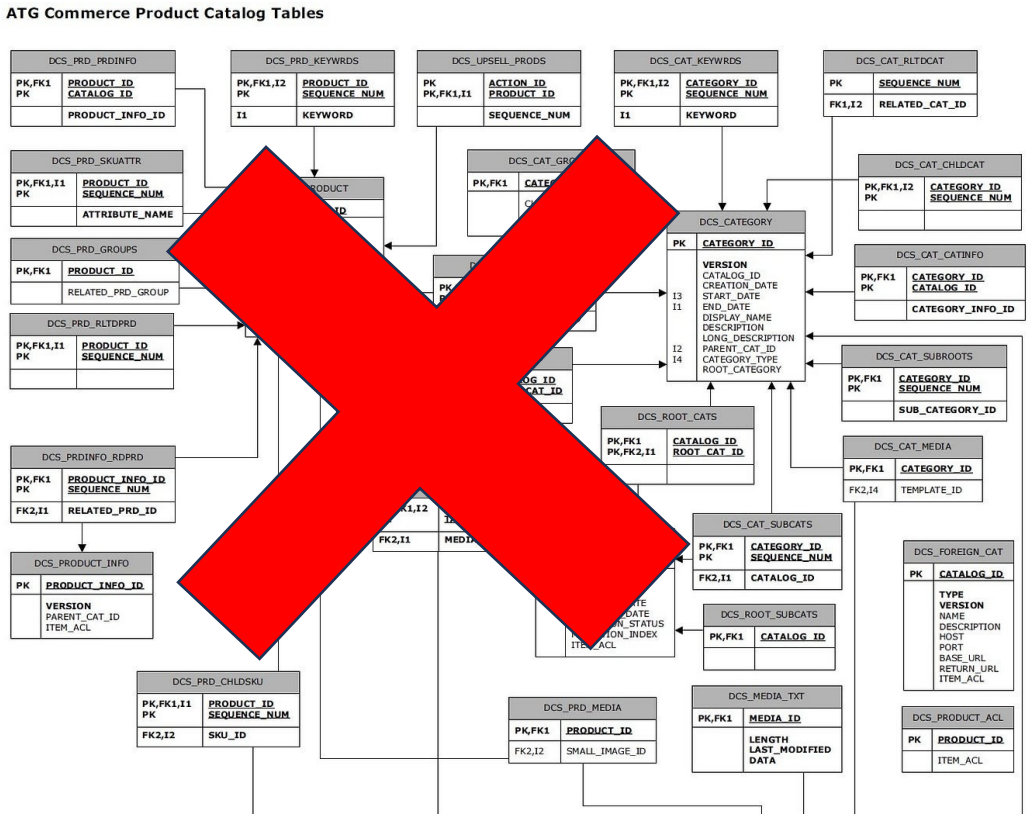
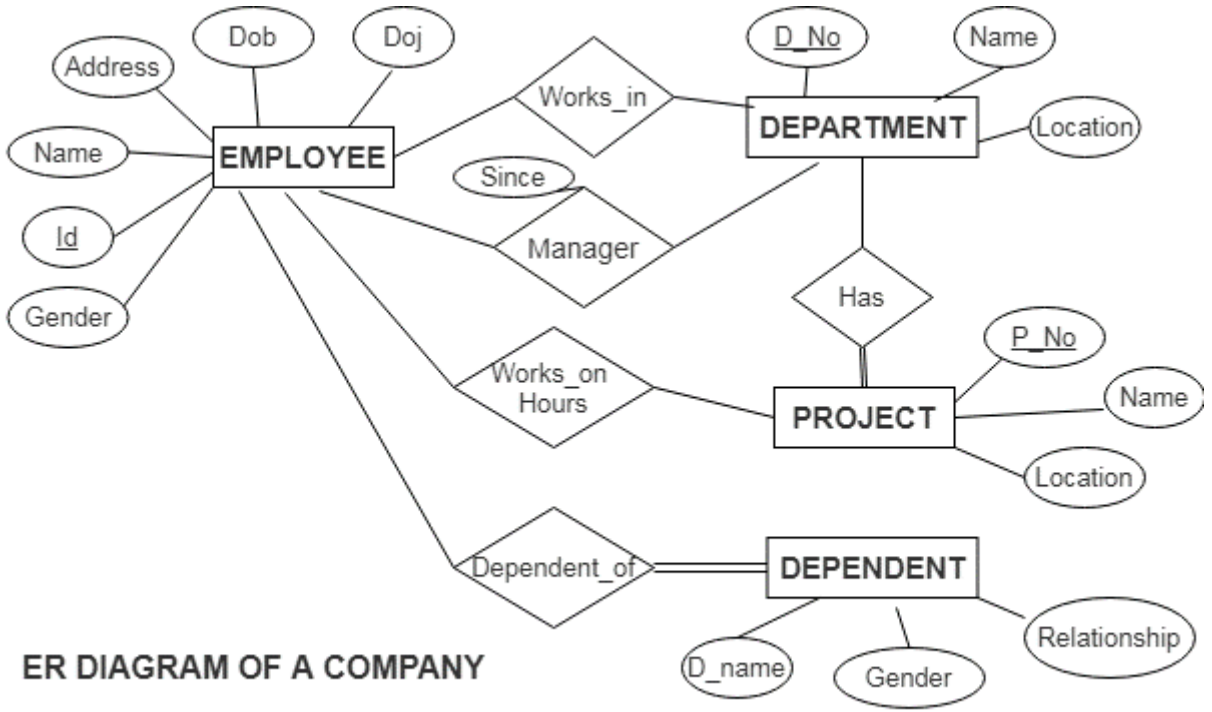
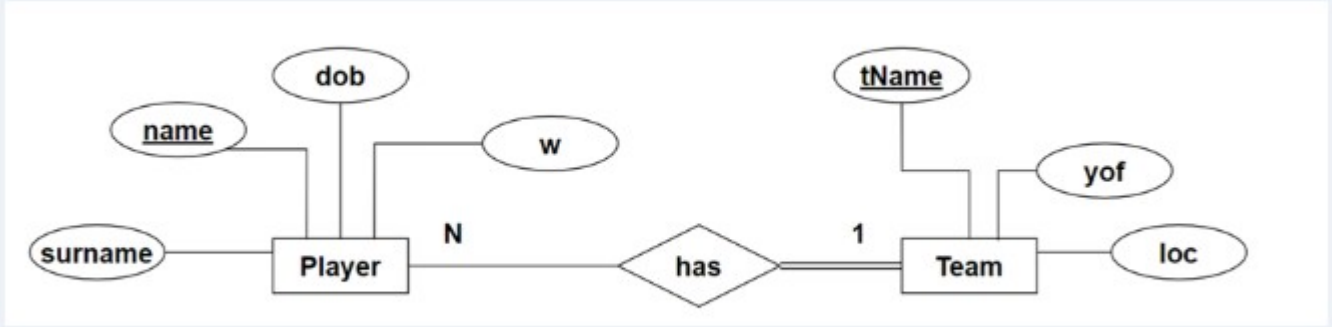




ER DIAGRAM OF A COMPANY

Previous year Exam Question

Please examine the ERD given below:



Describe in words what the ERD shown represents.

A team must have at least one player.
A player may belong to at most one team.