شُروع اَللہ کے پاک نام سے جو بڑا مہر بان نہایت رحم والا ہے

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Database Systems

Lecture 13

Database Schema Designing -2

Entity Relationship Diagram (ER-D)

Today's Lecture

- Database Schema Designing
  - Types of Attributes
  - Types of Entities
  - Entities VS Attributes

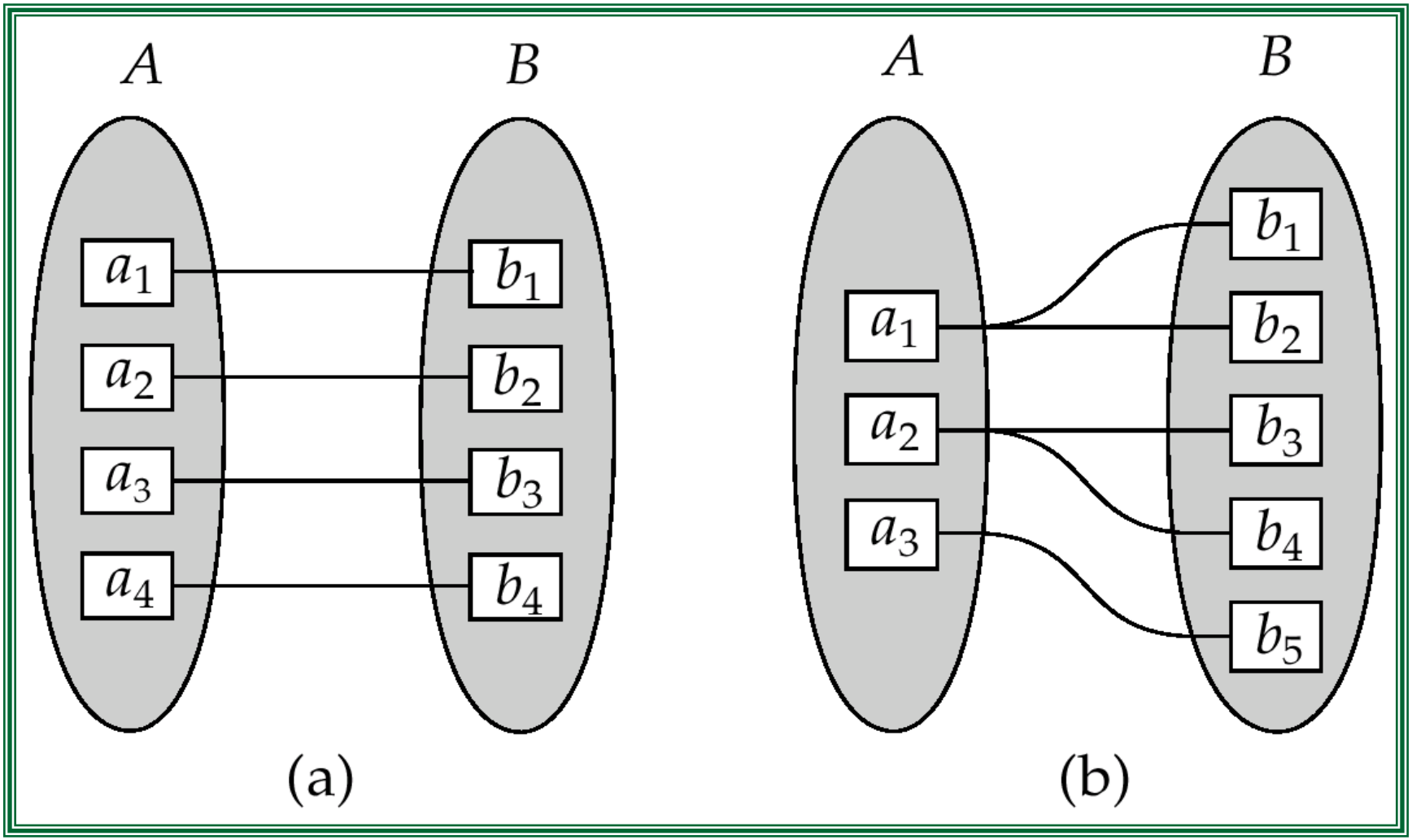
Recall Lecture 12

- Conceptual Schema Design Basics
  - Entity
  - Attributes
  - Relationships

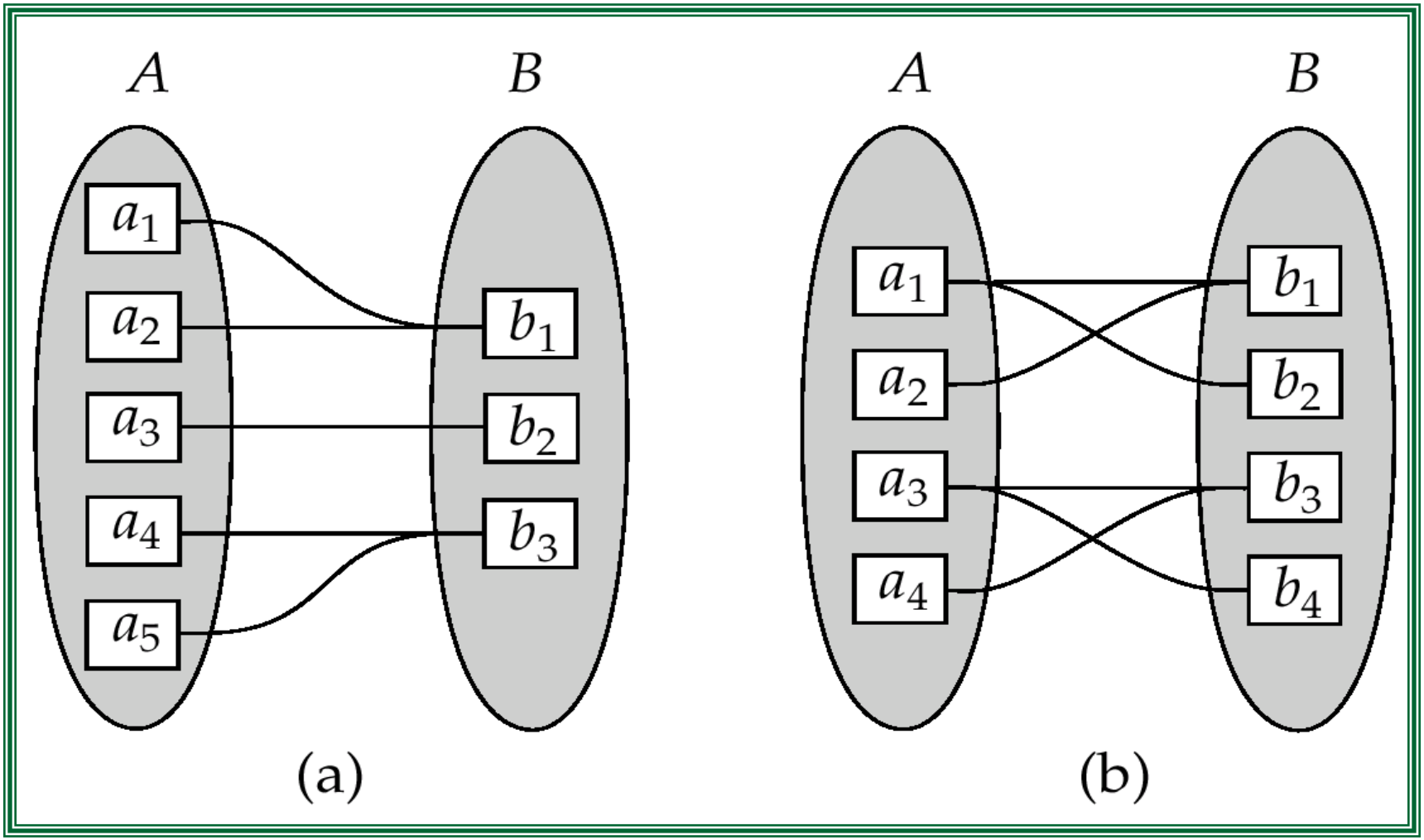
Relationship

- The degree of a relationship = the number of entity sets that participate in the relationship
  - Mostly binary relationships
  - Sometimes more
- Mapping cardinality of a relationship
  - 1 –1
  - 1 – many
  - many – 1
  - Many-many

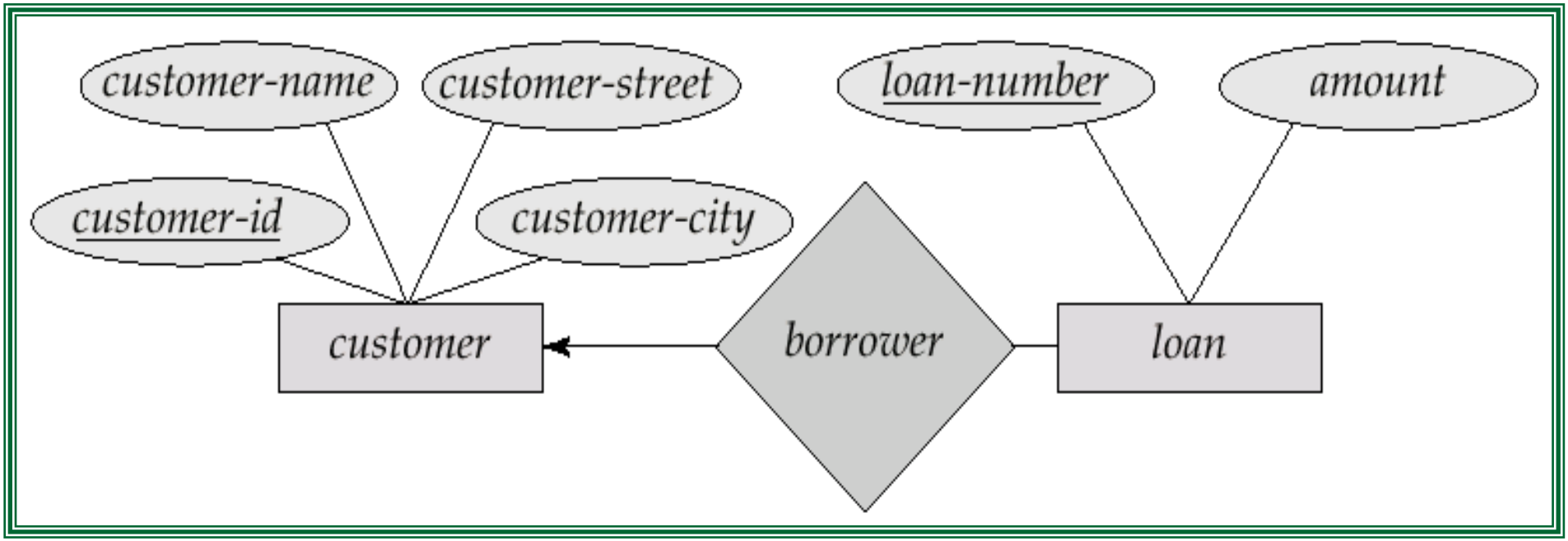
One-One and One-Many



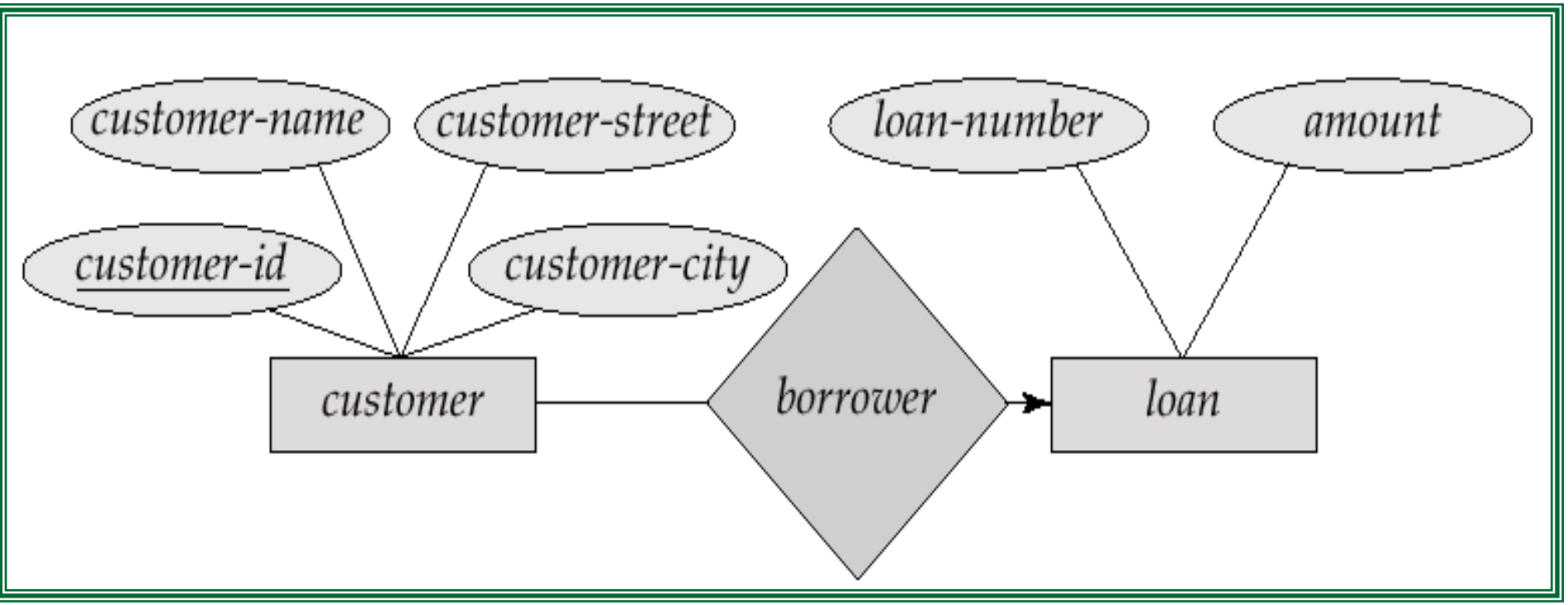
Many-one and many-many



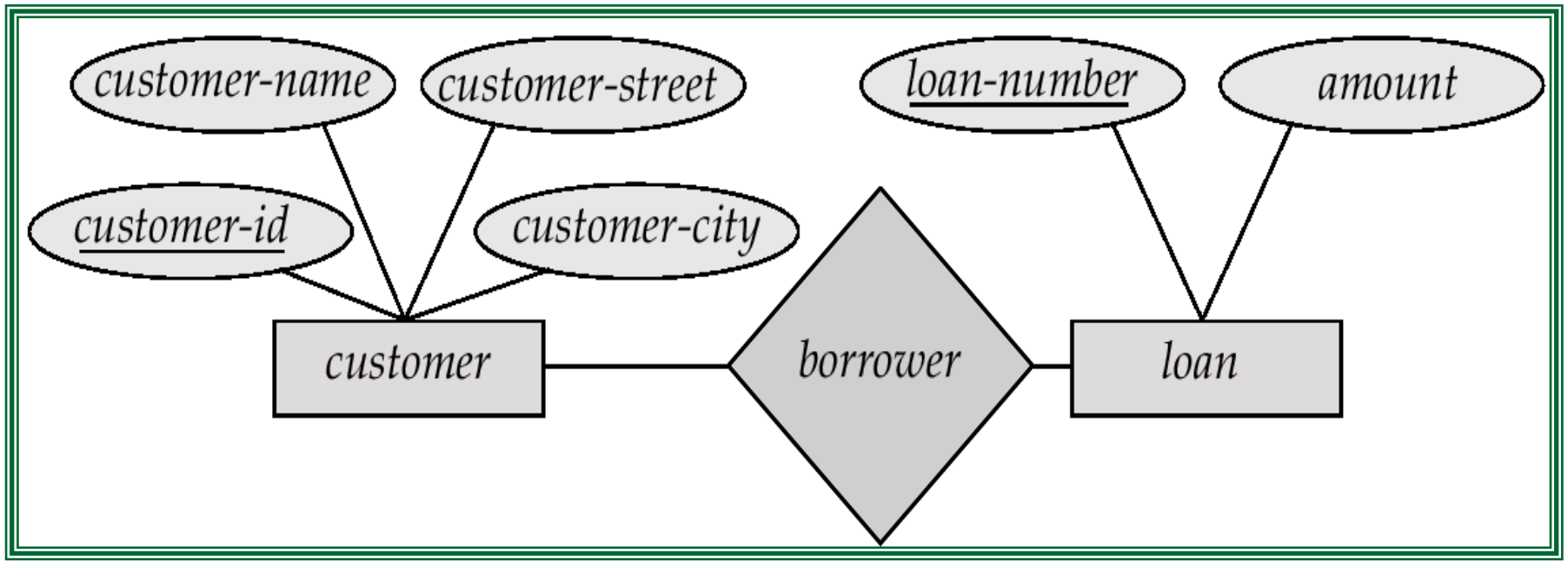
1- many


customer-name
customer-street
loan-number
amount
customer-id
customer-city
customer
borrower
loan

Many - 1

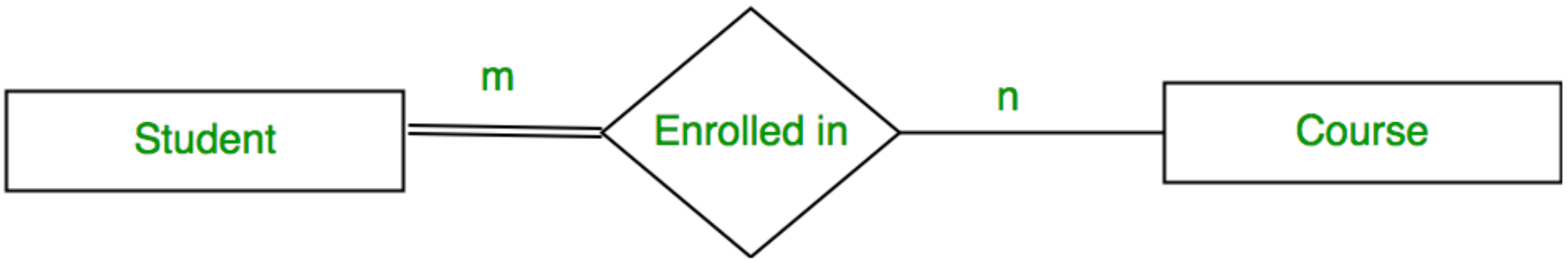

customer-name
customer-street
loan-number
amount
customer-id
customer-city
customer
borrower
loan

Many - many


customer-name
customer-street
loan-number
amount
customer-id
customer-city
customer
borrower
loan

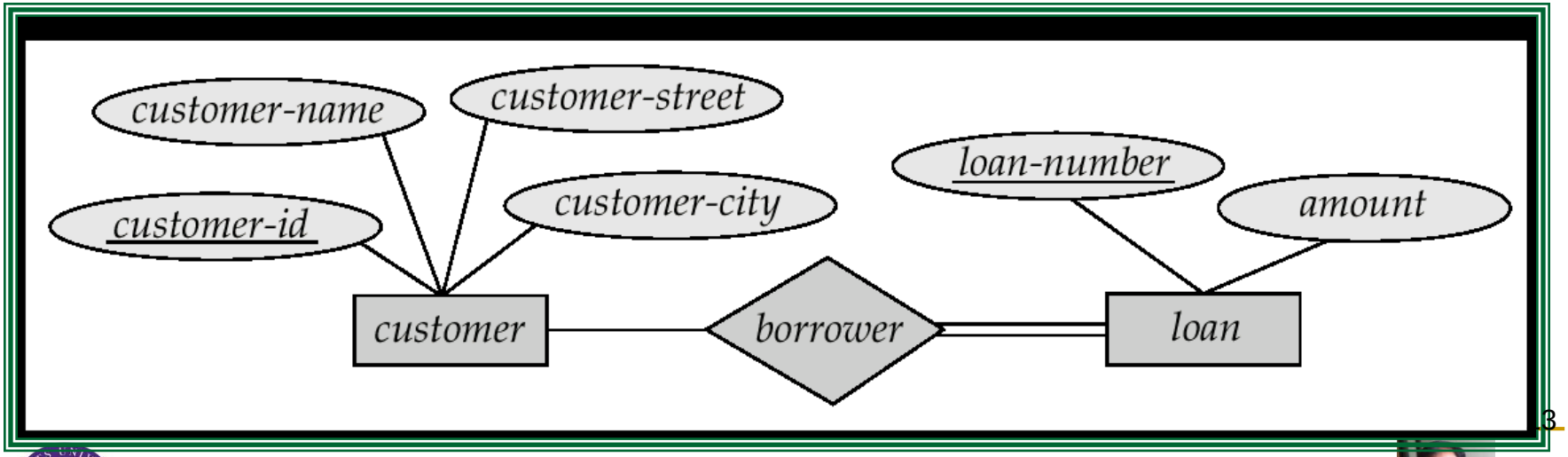
Partial Participation

- The entity in the entity set **may or may NOT participat**e in the relationship. If some courses are not enrolled by any of the student, the participation of course will be partial.
- Course Entity set having partial participation.



Participation Constraint: Total Participation

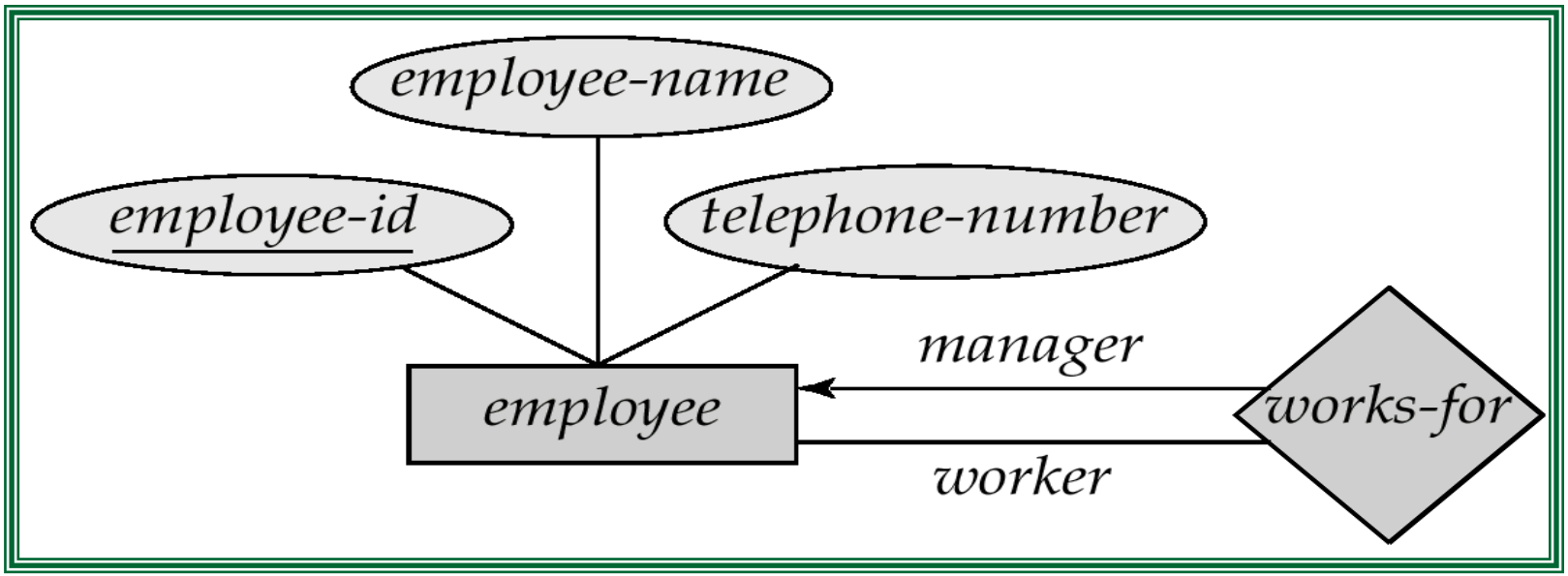
- When we require all entities to participate in the relationship (total participation)
- Each entity in the entity set must participate in the relationship. If each student must enroll in a course, the participation of student will be total. Total participation is shown by double line in ER diagram.



Every loan has to have at least one customer

Self Relationship

- Sometimes entities in a entity set may relate to other entities in the same set. Thus self relationship
- Here employees mange some other employees
- The labels “manger” and “worker” are called *roles* the self relationship



More examples on self-relationship

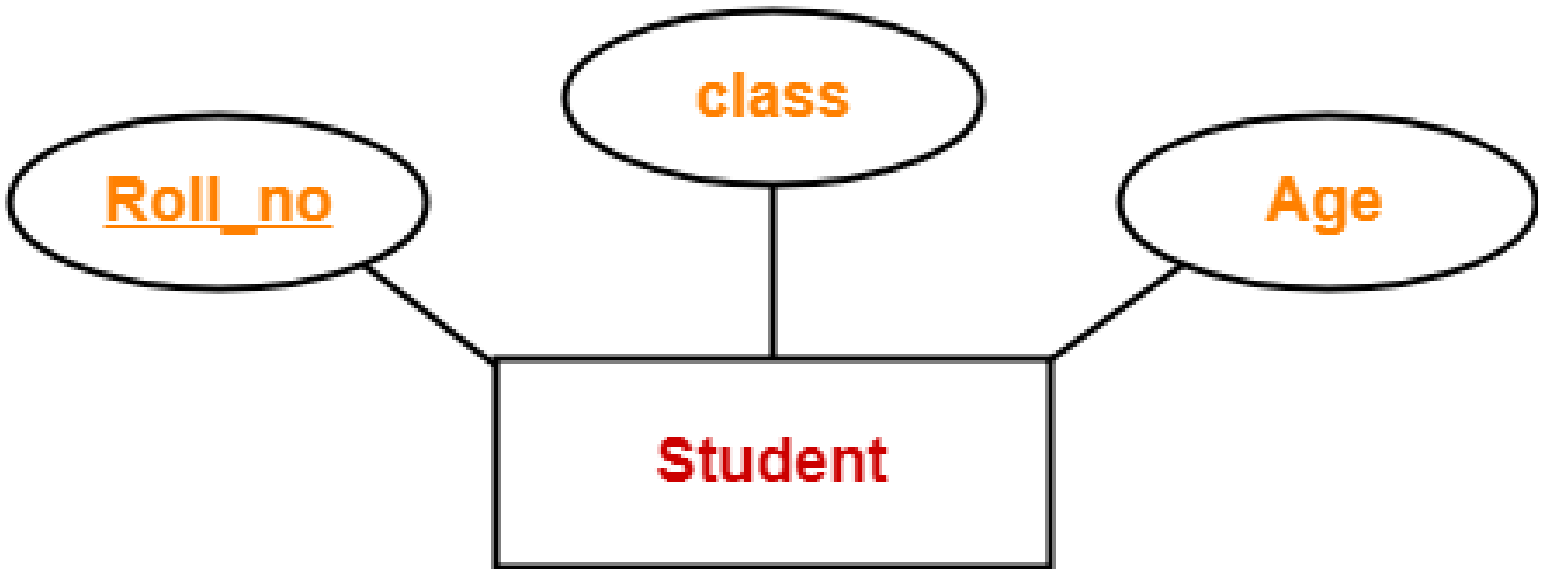
- People to people
  - Parent – children
  - Manager – employee
  - Husband – wife
- Word to word
  - Root – synonym

Types of Attributes

- Simple attributes
- Composite attributes
- Single valued attributes
- Multi valued attributes
- Derived attributes
- Key attributes

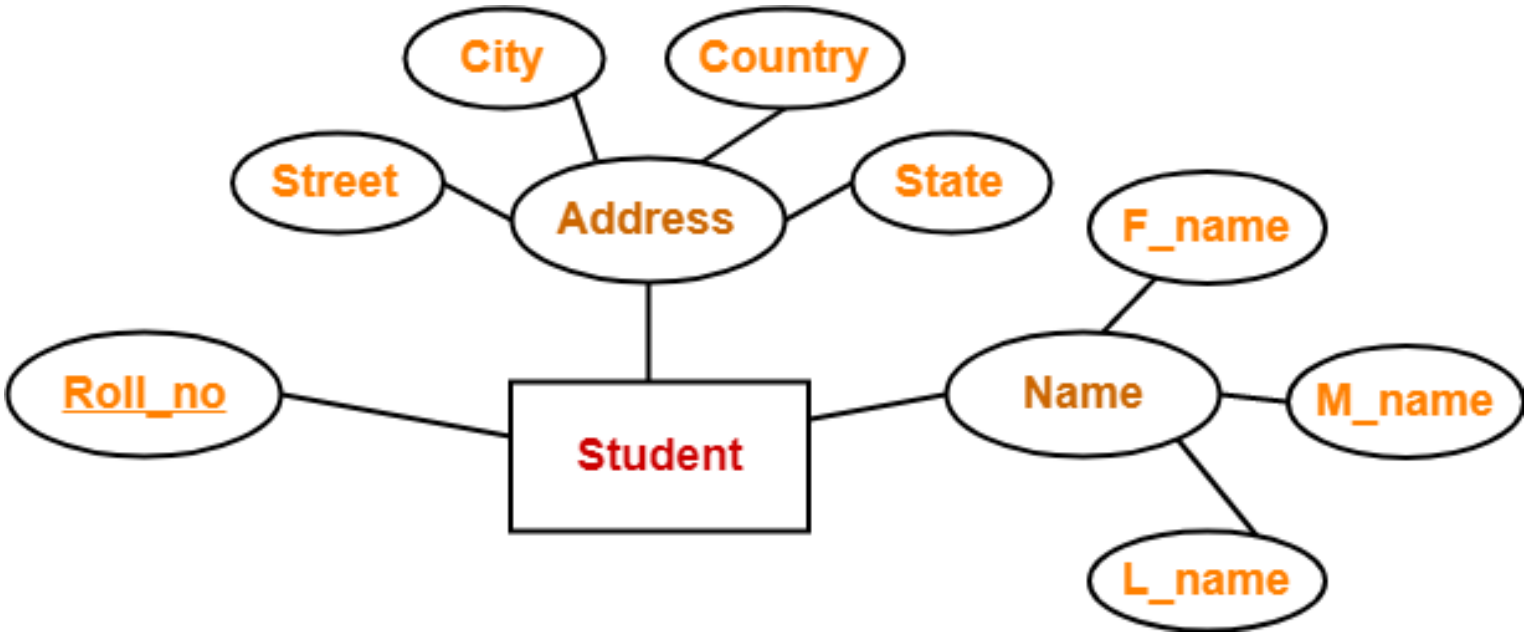
Simple attributes

- Simple attributes are those attributes which can not be divided further.



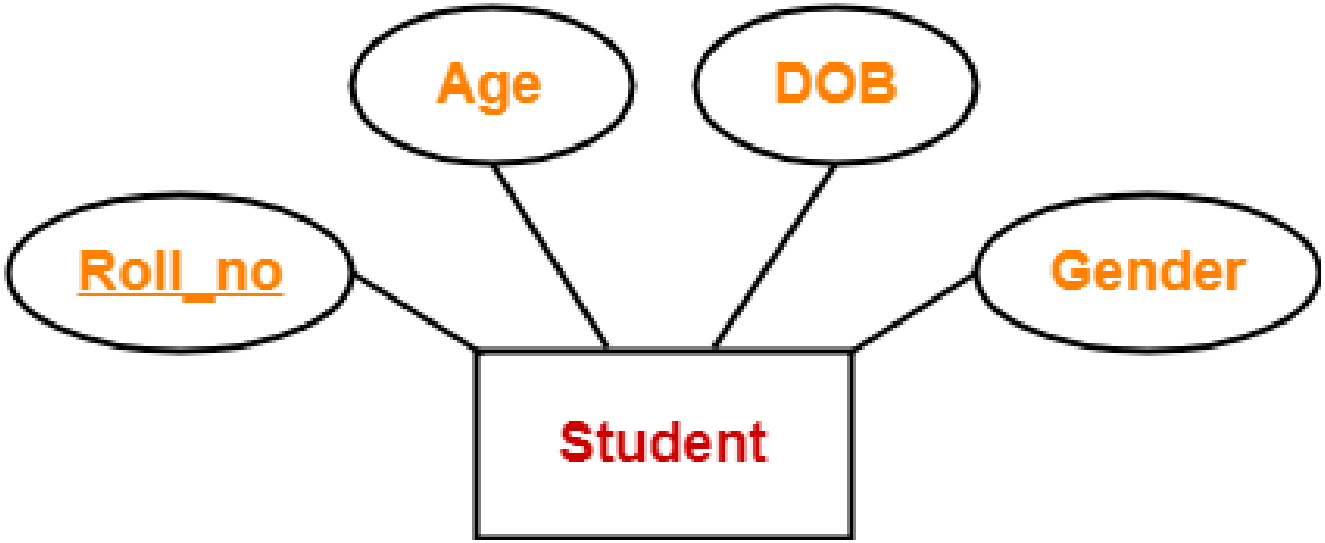
Composite attributes

- Composite attributes are those attributes which are composed of many other simple attributes.



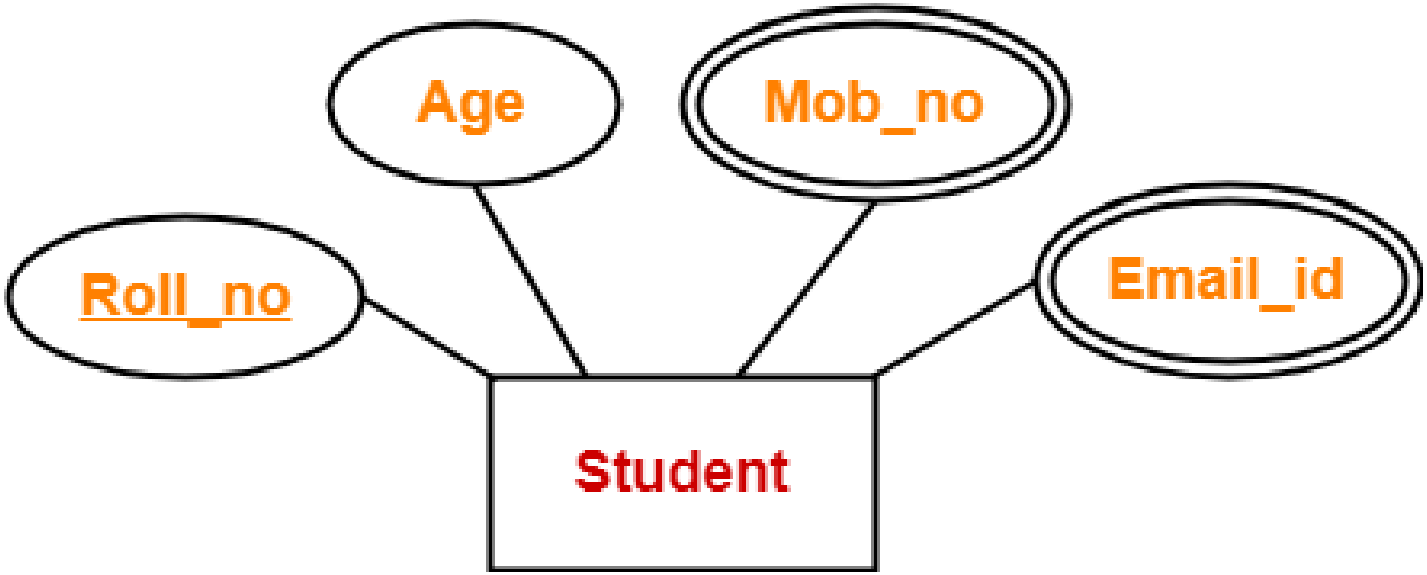
Single Valued Attributes-

- Single valued attributes are those attributes which can take only one value for a given entity from an entity set.



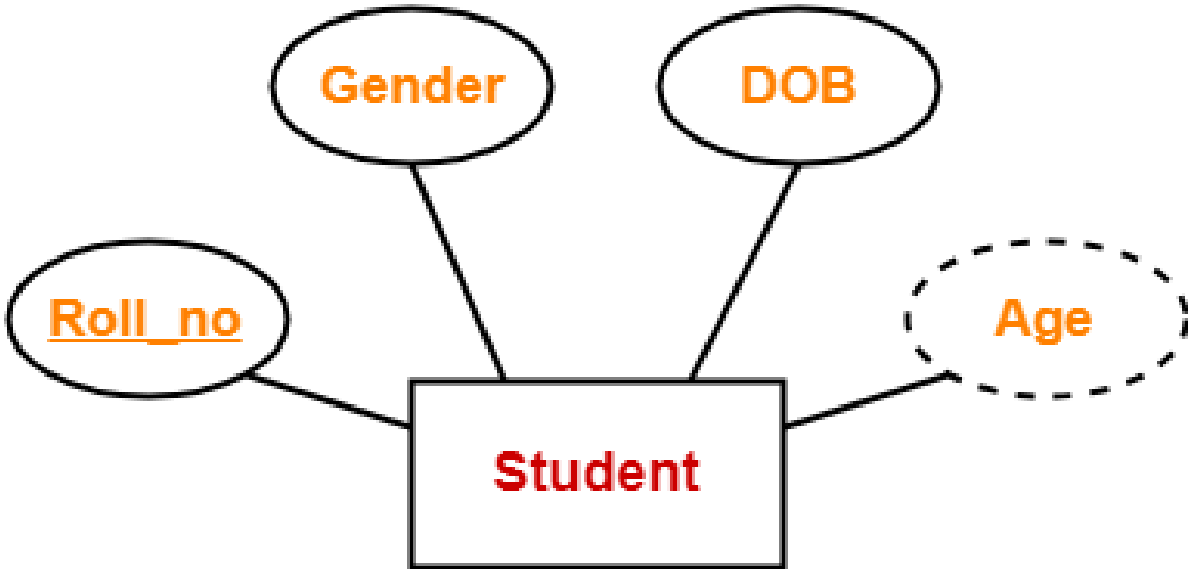
Multi valued attributes

- Multi valued attributes are those attributes which can take more than one value for a given entity from an entity set.



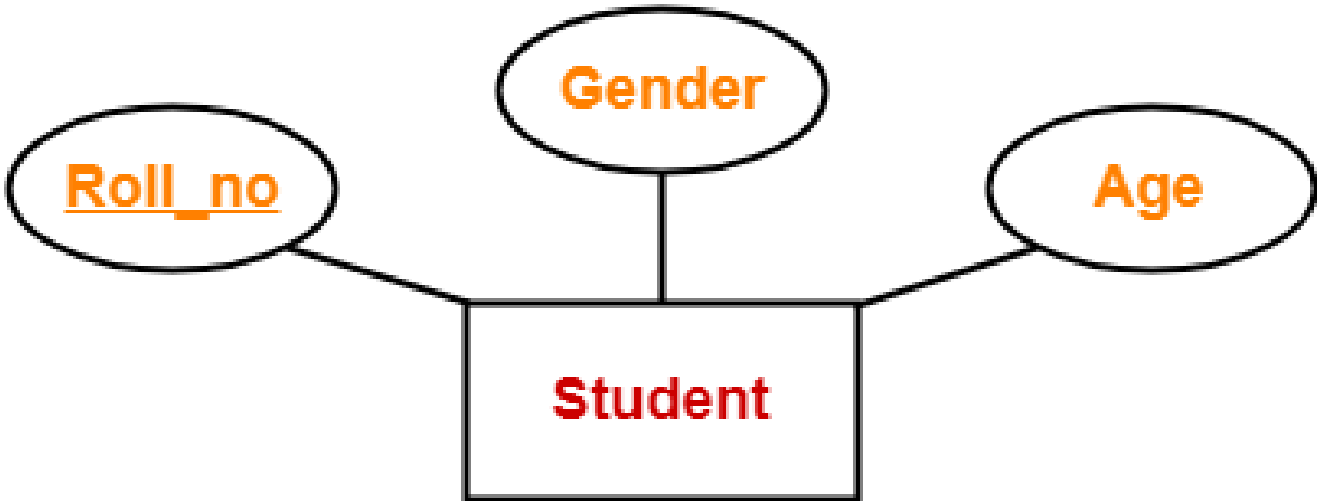
Derived attributes

- Derived attributes are those attributes which can be derived from other attribute(s).



Key attributes

- Identifier keys are used as key attributes



Keys

- A *super key* of an entity set is a set of one or more attributes whose values uniquely determine each entity.
- A *candidate key* of an entity set is a minimal super key
- Although several candidate keys may exist, one of the candidate keys is selected to be the *primary key*.

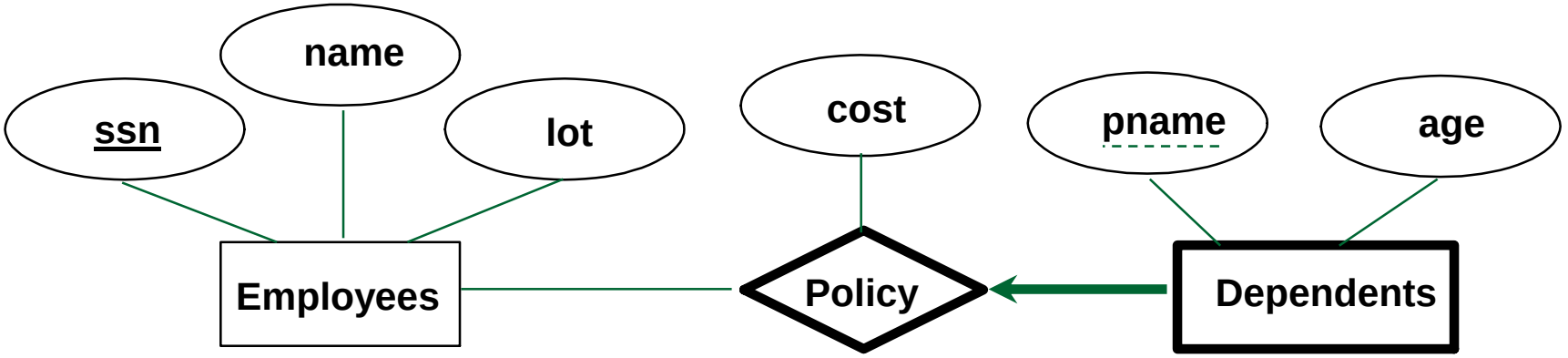
Types of Entities

- Strong Entities
- Weak Entities

Weak Entities

A *weak entity* can be identified uniquely only by considering the primary key of another (*owner*) entity.

- Owner entity set and weak entity set must participate in a one-to-many relationship set (one owner, many weak entities).
- Weak entity set must have total participation in this *identifying* relationship set.



Weak entities have only a "partial key" (dashed underline)

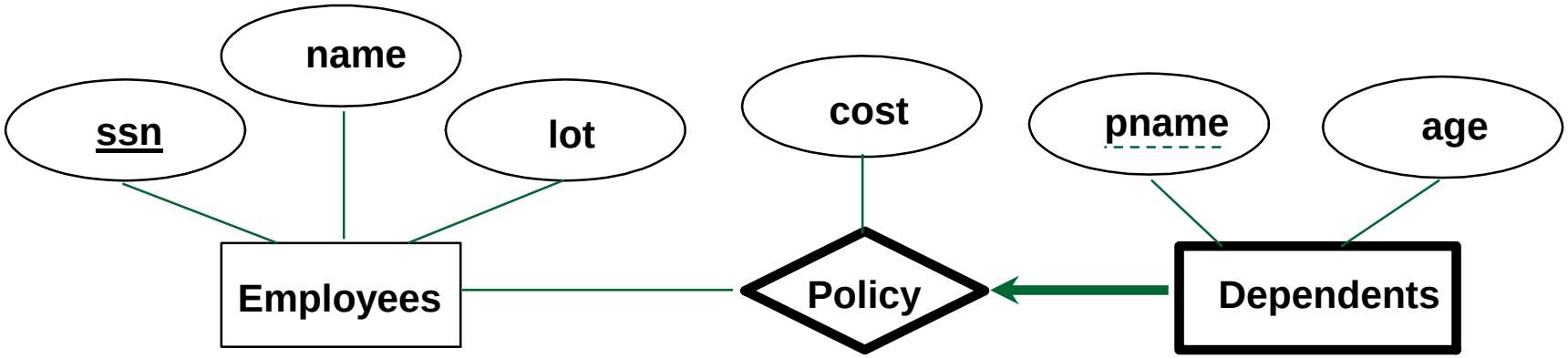
Translating Weak Entity Sets

- Weak entity set and identifying relationship set are translated into a single table
  - When the owner entity is deleted, all owned weak entities must also be deleted.

```
CREATE TABLE  Dep_Policy (
    pname  CHAR(20),
    age  INTEGER,
    cost  REAL,
    ssn  CHAR(11),
    PRIMARY KEY  (pname, ssn),
    FOREIGN KEY  (ssn) REFERENCES Employees,
       ON DELETE CASCADE)
```


Review: Weak Entities

- A *weak entity* can be identified uniquely only by considering the primary key of another (*owner*) entity.
  - Owner entity set and weak entity set must participate in a one-to-many relationship set (1 owner, many weak entities).
  - Weak entity set must have total participation in this *identifying* relationship set.

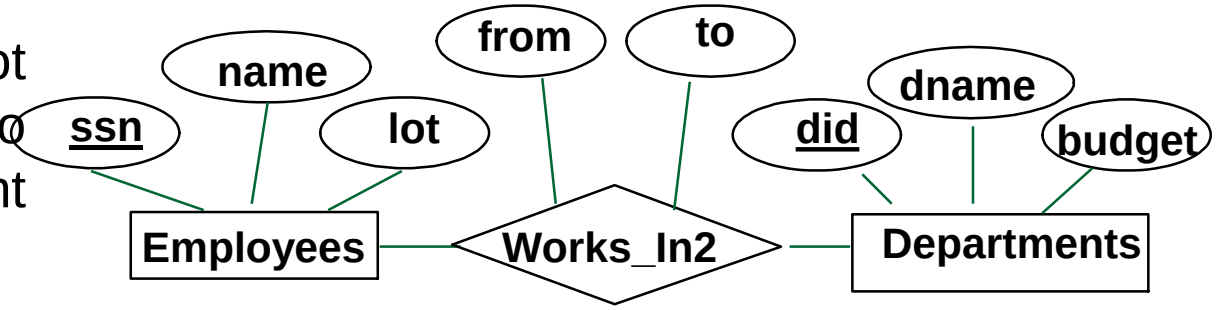


Entity vs. Attribute

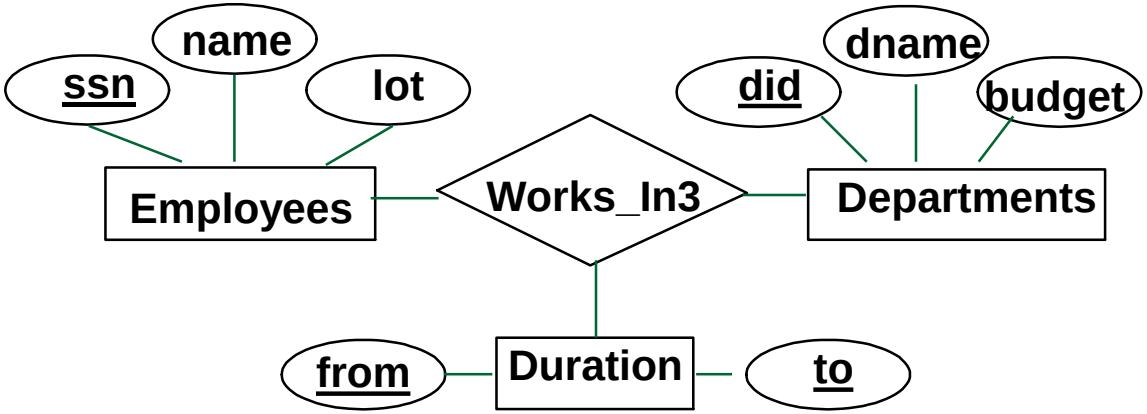
- Should *address* be an attribute of Employees or an entity (related to Employees)?
- Depends upon how we want to use address information, and the semantics of the data:
  - If we have several addresses per employee, *address* must be an entity (since attributes cannot be set-valued).
  - If the structure (city, street, etc.) is important, *address* must be modeled as an entity (since attribute values are atomic).

Entity vs. Attribute (Cont.)

- Works_In2 does not allow an employee to work in a department for two or more periods.

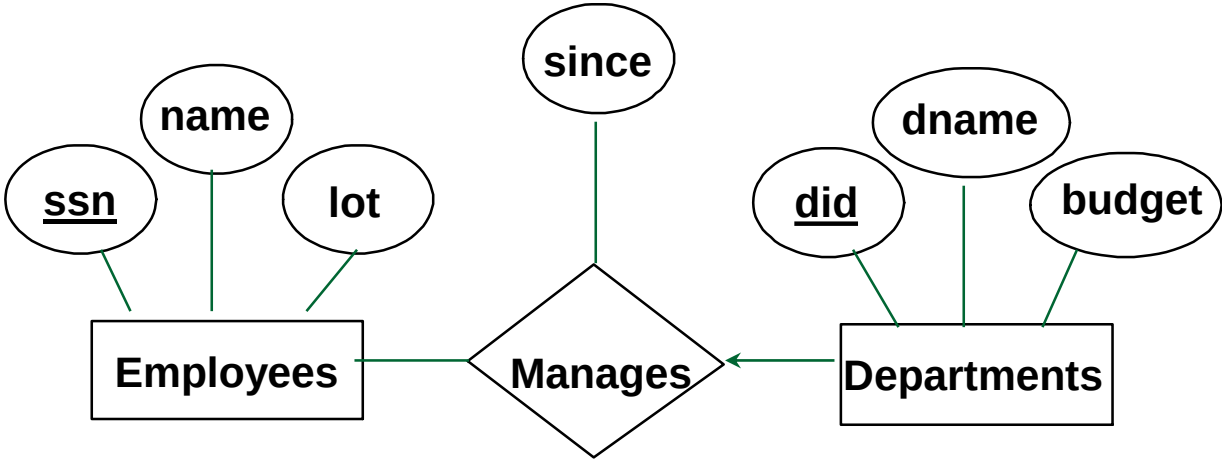


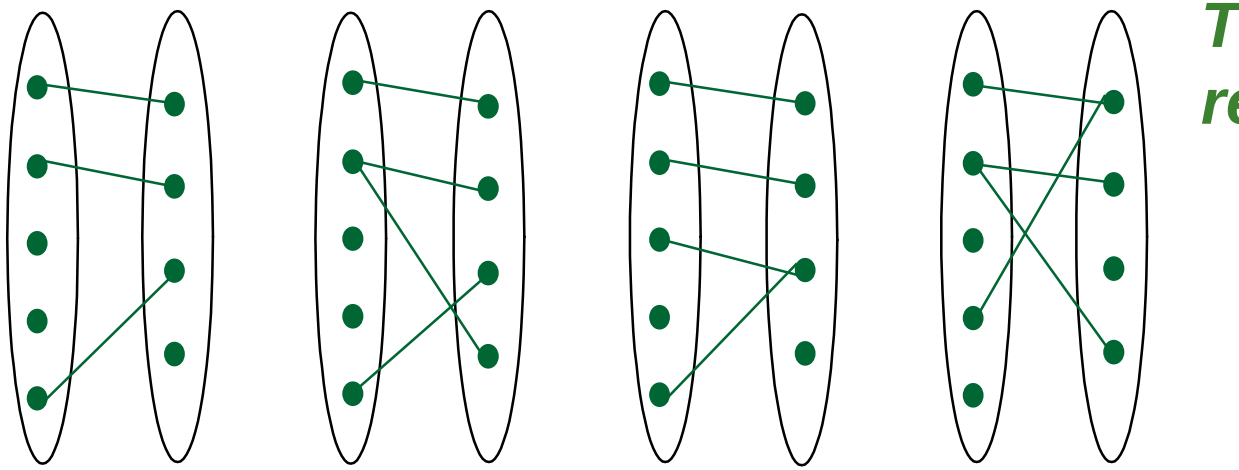
- Similar to the problem of wanting to record several addresses for an employee: we want to record *several values of the descriptive attributes for each instance of this relationship.*



Review: Key Constraints

- Each dept has at most one manager, according to the *key constraint* on Manages.





Translation to relational model

?

ERD Notations

Entity

Attribute

Relationship

Weak Entity

Multivalued Attribute

Weak Relationship

In Next Lecture

- Database Schema Designing
  - Entity Relationship Diagram (ER-D)
  - How to Design an ERD

Thanks