How to translate ER Model to Relational Model

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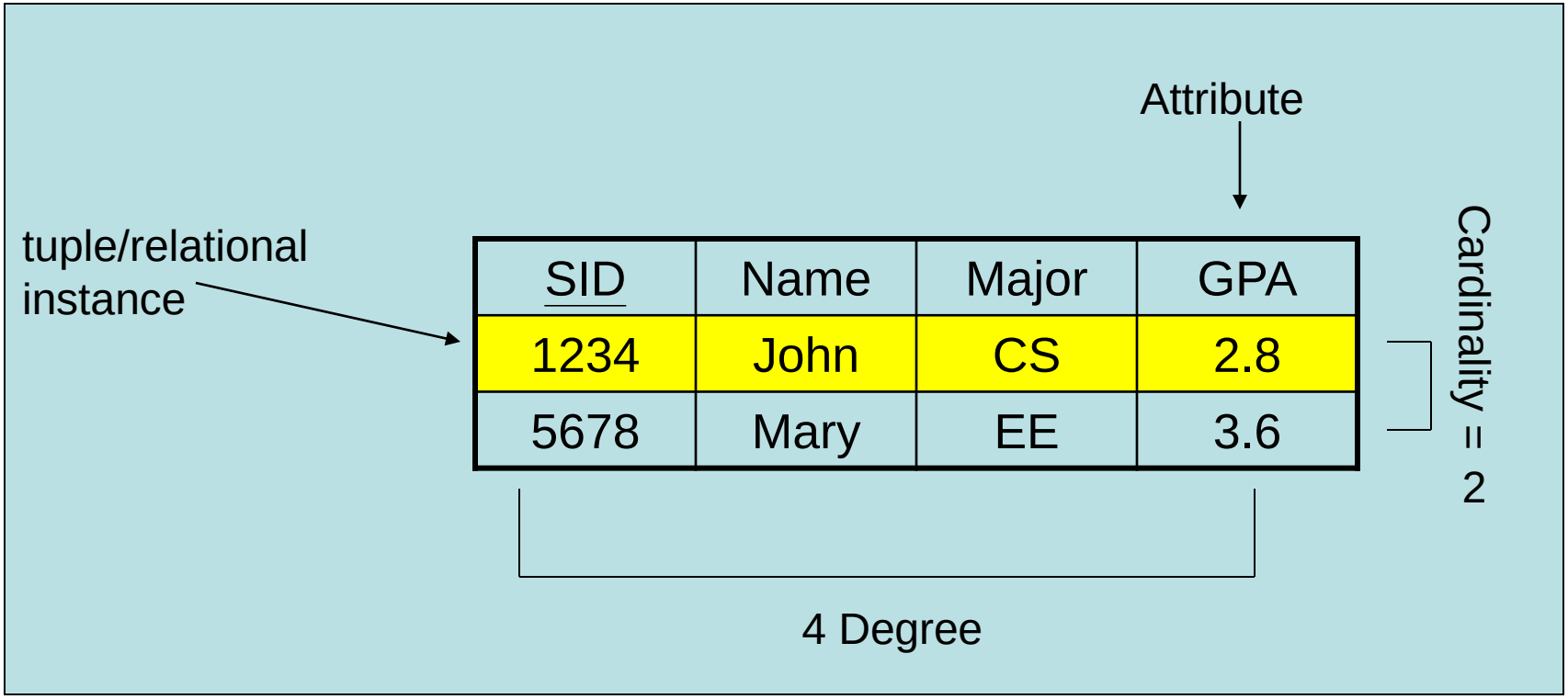
Review - Concepts

Relational Model is made up of tables

- A row of table = a relational instance/tuple
- A column of table = an attribute
- A table = a schema/relation
- Cardinality = number of rows
- Degree = number of columns

Review - Example



A Schema / Relation

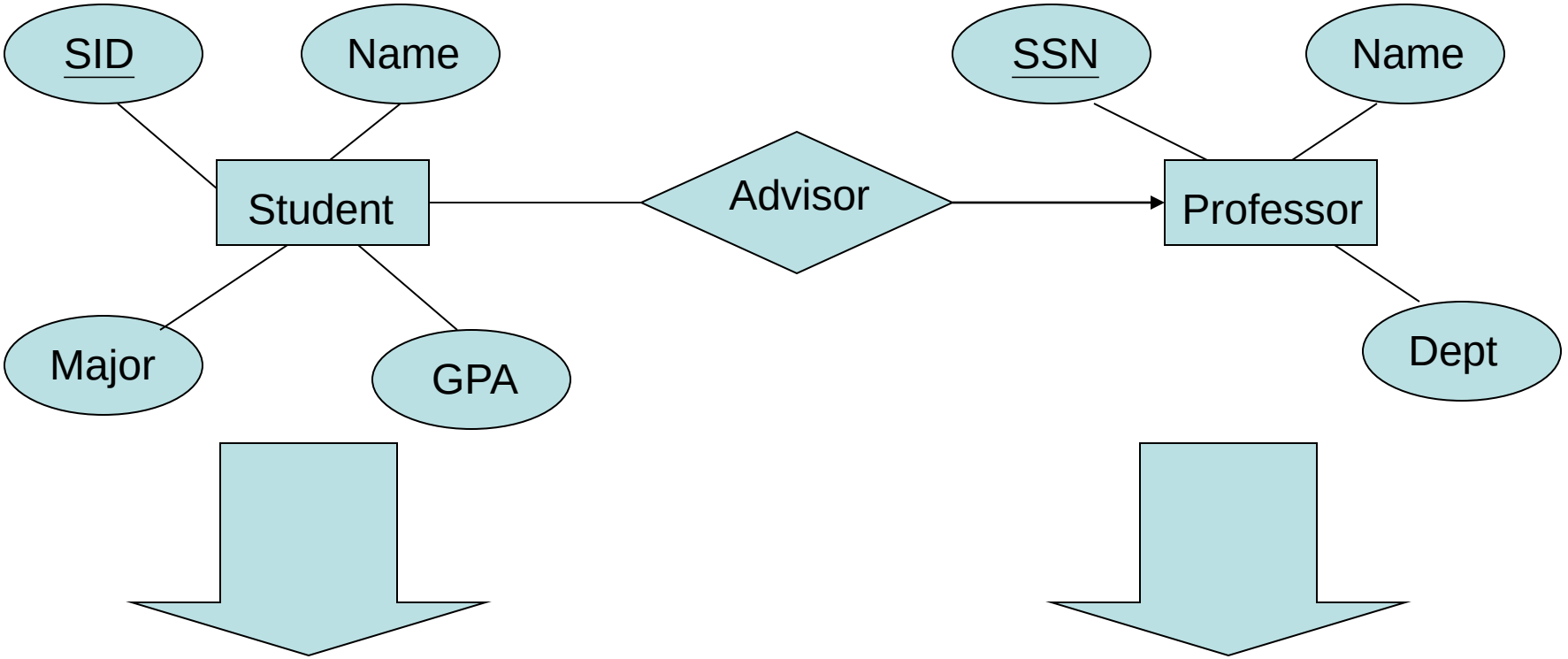
From ER Model to Relational Model

So… how do we convert an ER diagram into a table?? Simple!!

Basic Ideas:

- Build a table for each entity set
- Build a table for each relationship set if necessary (more on this later)
- Make a column in the table for each attribute in the entity set
- Indivisibility Rule and Ordering Rule
- Primary Key

Example – Strong Entity Set



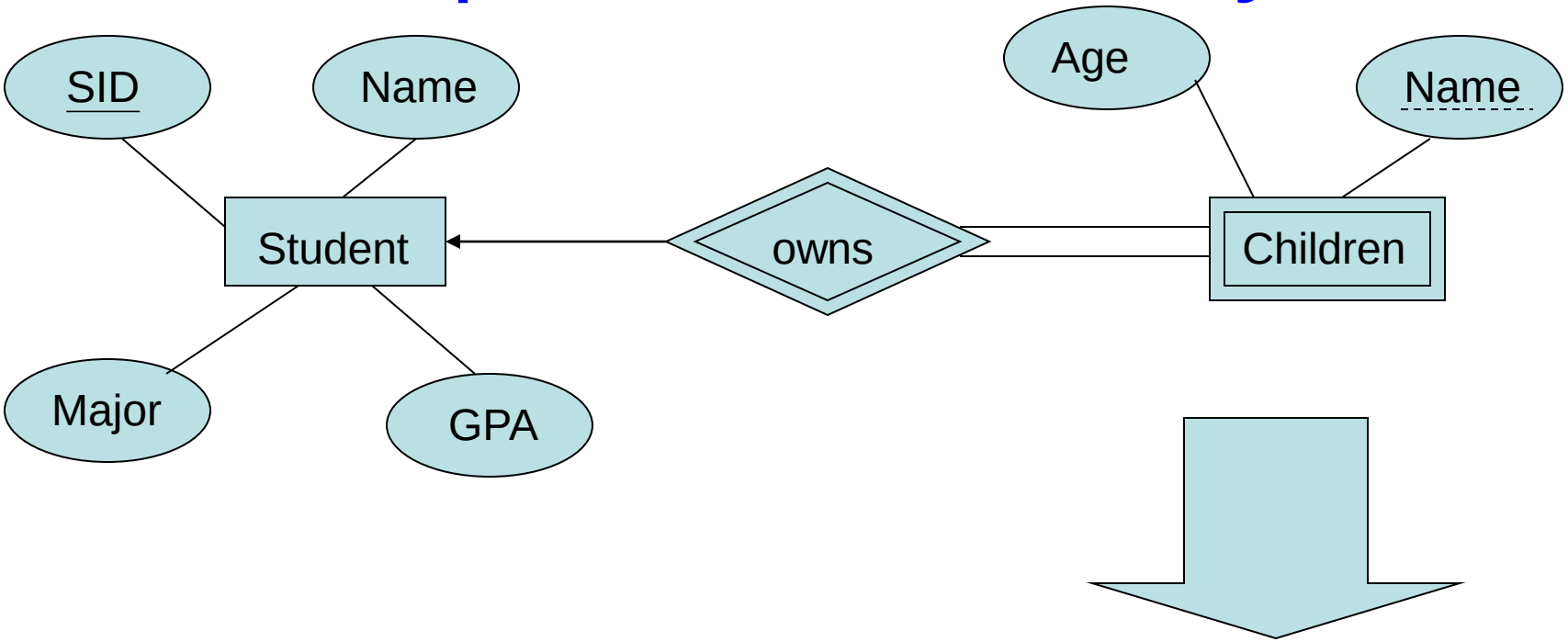
SID	Name	Major	GPA
1234	John	CS	2.8
5678	Mary	EE	3.6

SSN	Name	Dept
9999	Smith	Math
8888	Lee	CS

Representation of Weak Entity Set

- Weak Entity Set Cannot exists alone
- To build a table/schema for weak entity set
  - Construct a table with one column for each attribute in the weak entity set
  - Remember to include discriminator
  - Augment one extra column on the right side of the table, put in there the primary key of the Strong Entity Set (the entity set that the weak entity set is depending on)
  - Primary Key of the weak entity set = Discriminator + foreign key

Example – Weak Entity Set



Age	Name	Parent_SID
10	Bart	1234
8	Lisa	5678

* Primary key of *Children* is *Parent_SID* + *Name*

Representation of Relationship Set

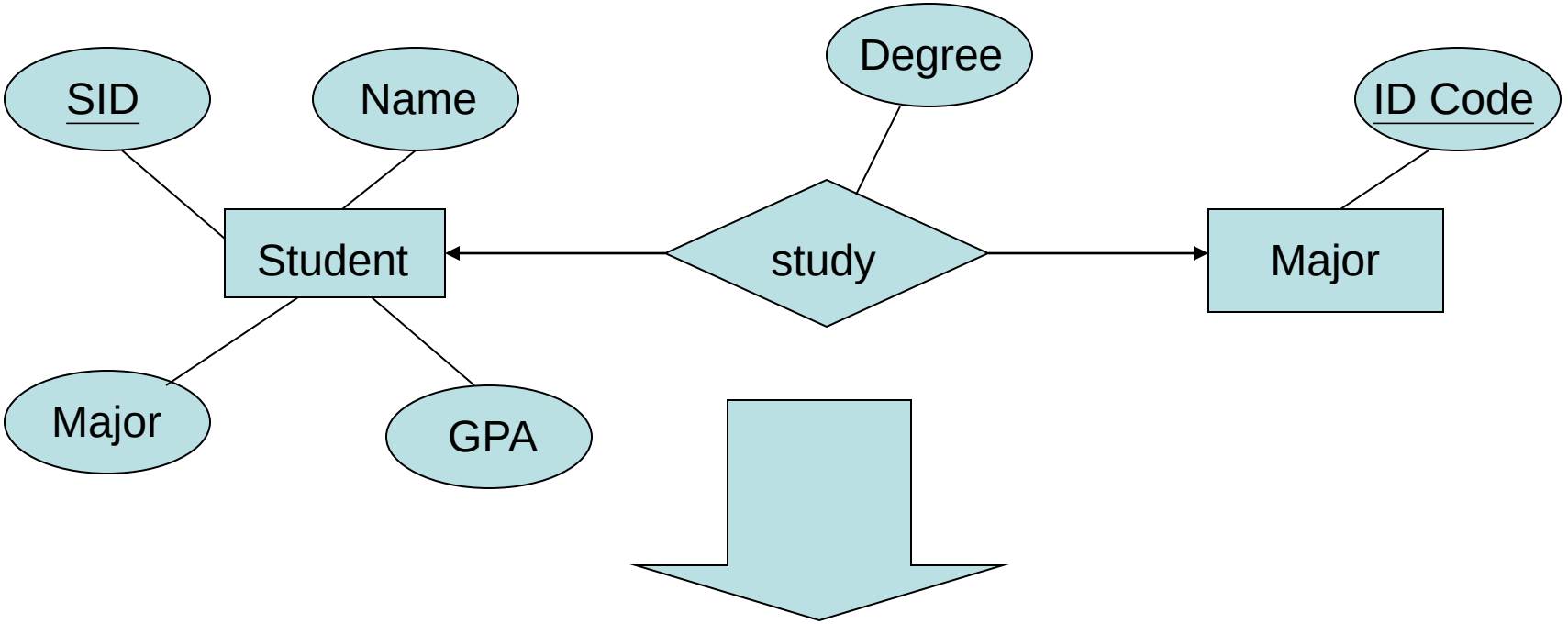
--This is a little more complicated--

- ✓ Unary/Binary Relationship set
  - ➢ Depends on the cardinality and participation of the relationship
  - ➢ Two possible approaches
- ✓ N-ary (multiple) Relationship set
  - ➢ Primary Key Issue
- ✓ Identifying Relationship
  - ➢ No relational model representation necessary

Representing Relationship Set
Unary/Binary Relationship

- For one-to-one relationship w/out total participation
  - Build a table with two columns, one column for each participating entity set's primary key. Add successive columns, one for each descriptive attributes of the relationship set (if any).
- For one-to-one relationship with one entity set having total participation
  - Augment one extra column on the right side of the table of the entity set with total participation, put in there the primary key of the entity set without complete participation as per to the relationship.

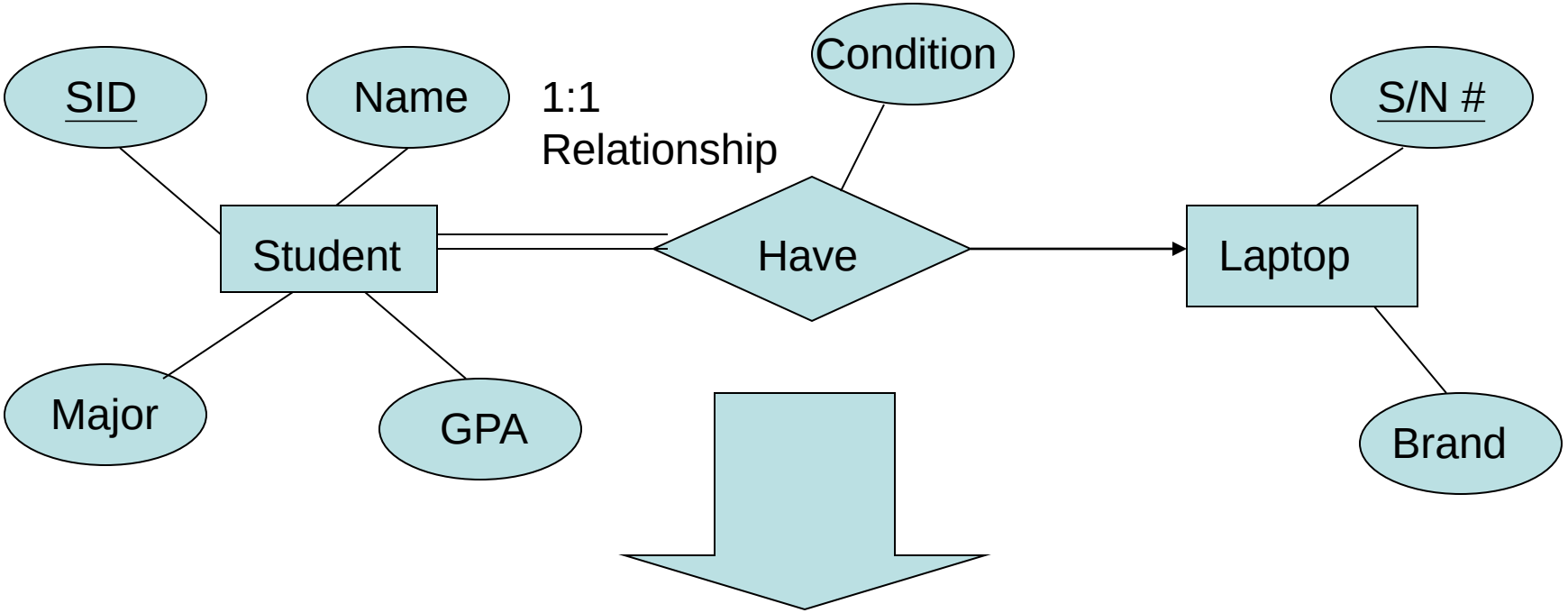
Example – One-to-One Relationship Set



SID	Maj_ID Co	S_Degree
9999	07	1234
8888	05	5678

* Primary key can be either *SID* or Maj_*ID_Co*

Example – One-to-One Relationship Set



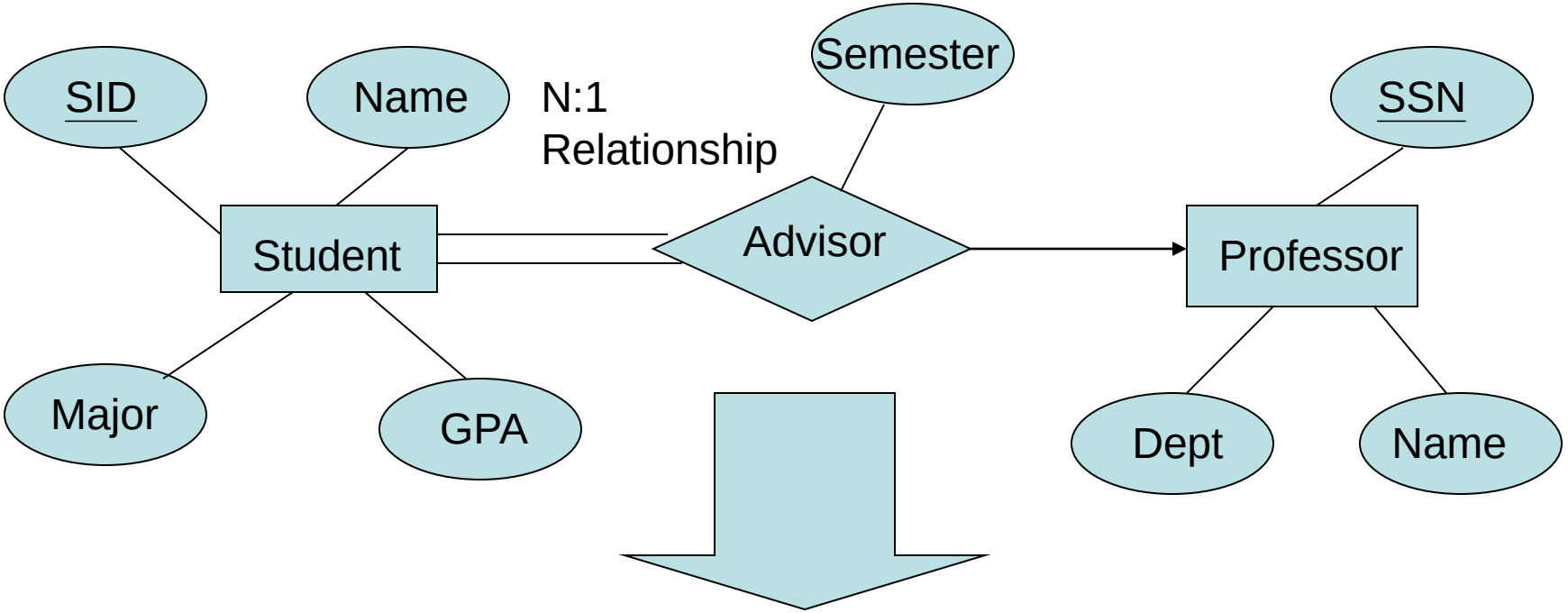
SID	Name	Major	GPA	LP_S/N	Hav_Cond
9999	Bart	Economy	-4.0	123-456	Own
8888	Lisa	Physics	4.0	567-890	Loan

* Primary key can be either *SID* or *LP_S/N*

Representing Relationship Set
Unary/Binary Relationship

- For one-to-many relationship w/out total participation
  - Same thing as one-to-one
- For one-to-many/many-to-one relationship with one entity set having total participation on “many” side
  - Augment one extra column on the right side of the table of the entity set on the “many” side, put in there the primary key of the entity set on the “one” side as per to the relationship.

Example – Many-to-One Relationship Set



SID	Name	Major	GPA	Pro_SSN	Ad_Sem
9999	Bart	Economy	-4.0	123-456	Fall 2006
8888	Lisa	Physics	4.0	567-890	Fall 2005

* Primary key of this table is *SID*

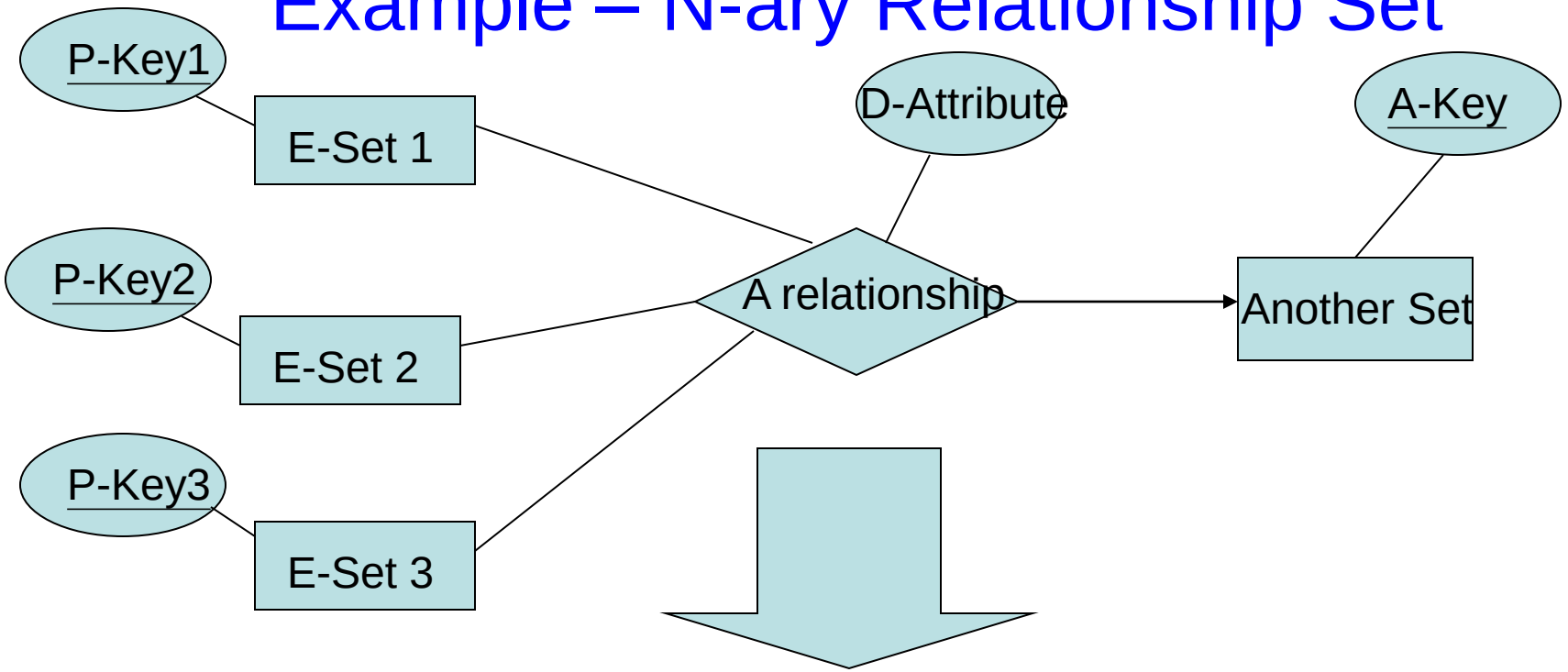
Representing Relationship Set
Unary/Binary Relationship

- For many-to-many relationship
  - Same thing as one-to-one relationship without total participation.
  - Primary key of this new schema is the union of the foreign keys of both entity sets.
  - No augmentation approach possible…

Representing Relationship Set
N-ary Relationship

- Intuitively Simple
  - Build a new table with as many columns as there are attributes for the union of the primary keys of all participating entity sets.
  - Augment additional columns for descriptive attributes of the relationship set (if necessary)
  - The primary key of this table is the union of all primary keys of entity sets that are on “many” side
  - That is it, we are done.

Example – N-ary Relationship Set



P-Key1	P-Key2	P-Key3	A-Key	D-Attribute
9999	8888	7777	6666	Yes
1234	5678	9012	3456	No

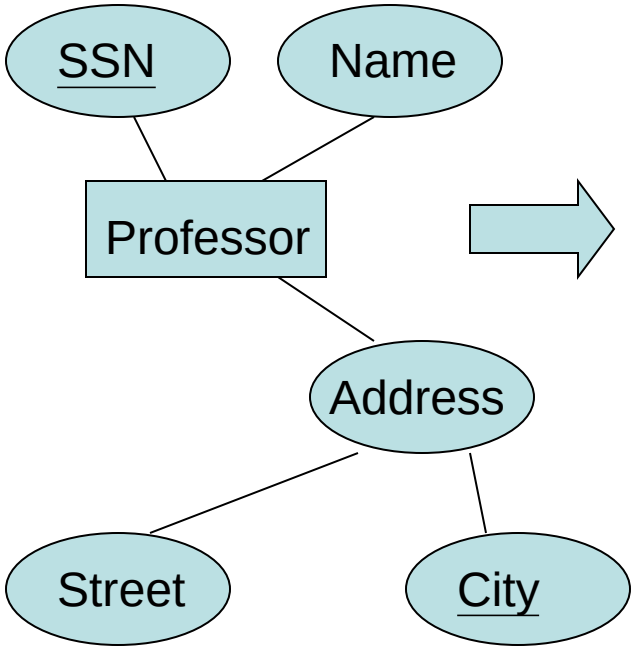
* Primary key of this table is *P-Key1* + *P-Key2* + *P-Key3*

Representing Relationship Set
Identifying Relationship

- This is what you have to know
  - You DON’T have to build a table/schema for the identifying relationship set once you have built a table/schema for the corresponding weak entity set
  - Reason:
    - A special case of one-to-many with total participation
    - Reduce Redundancy

Representing Composite Attribute

- Relational Model Indivisibility Rule Applies
- One column for each component attribute
- NO column for the composite attribute itself

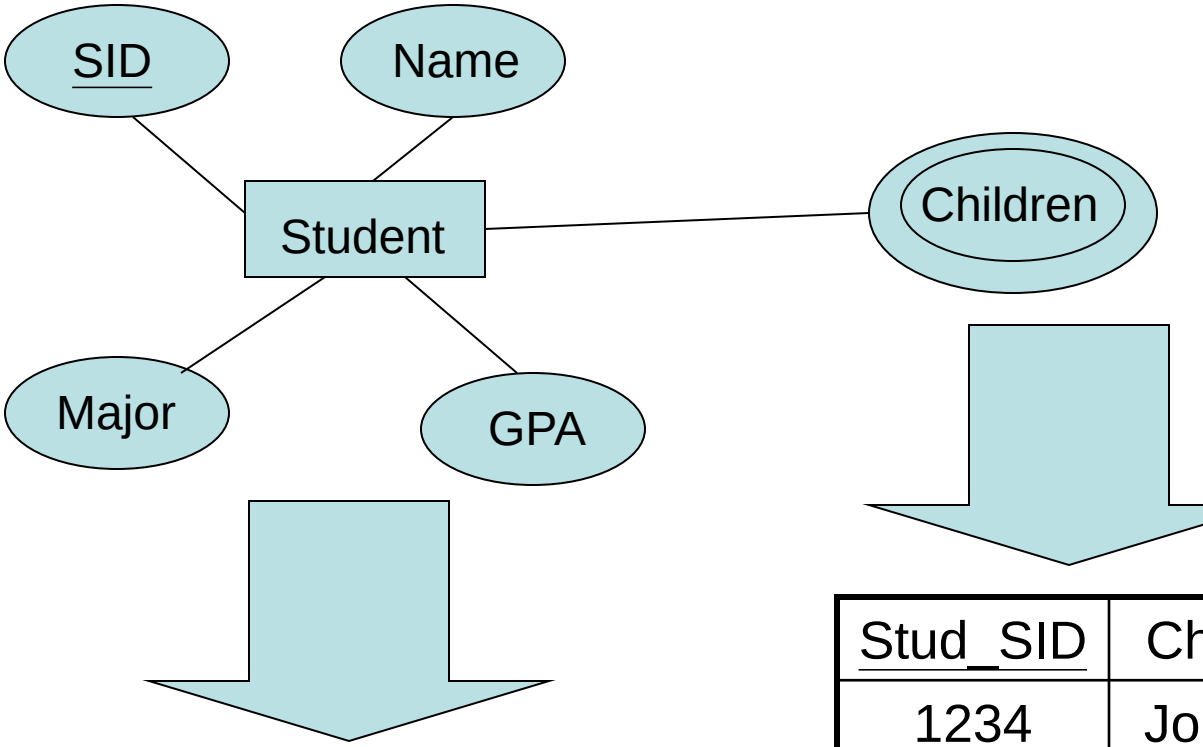


SSN	Name	Street	City
9999	Dr. Smith	50 1st St.	Fake City
8888	Dr. Lee	1 B St.	San Jose

Representing Multivalue Attribute

- For each multivalue attribute in an entity set/relationship set
  - Build a new relation schema with two columns
  - One column for the primary keys of the entity set/relationship set that has the multivalue attribute
  - Another column for the multivalue attributes. Each cell of this column holds only one value. So each value is represented as an unique tuple
  - Primary key for this schema is the union of all attributes

Example – Multivalue attribute



The primary key for this table is Student_SID + Children, the union of all attributes

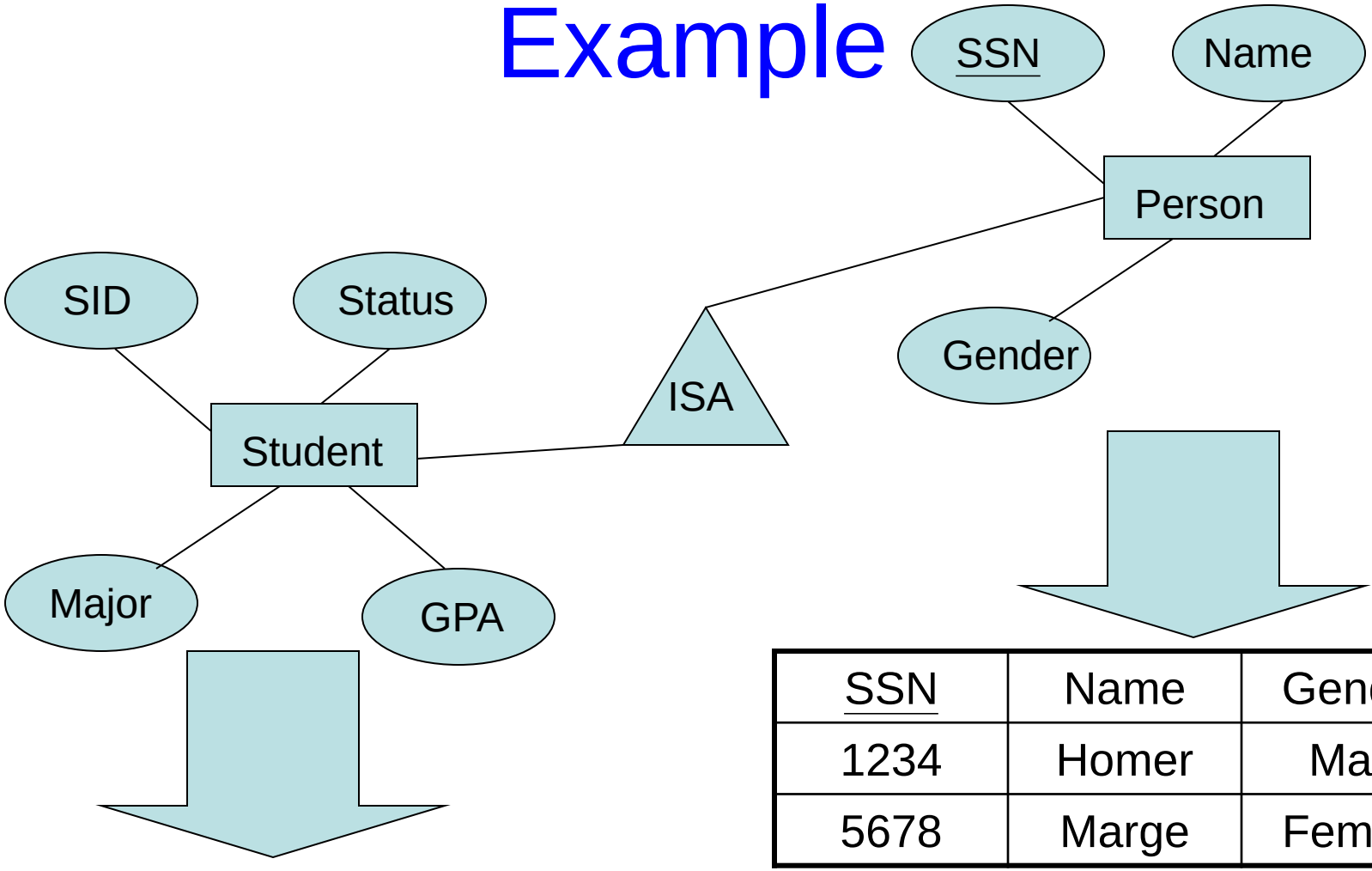
SID	Name	Major	GPA
1234	John	CS	2.8
5678	Homer	EE	3.6

Stud_SID	Children
1234	Johnson
1234	Mary
5678	Bart
5678	Lisa
5678	Maggie

Representing Class Hierarchy

- Two general approaches depending on disjointness and completeness
  - For non-disjoint and/or non-complete class hierarchy:
    - create a table for each super class entity set according to normal entity set translation method.
    - Create a table for each subclass entity set with a column for each of the attributes of that entity set plus one for each attributes of the primary key of the super class entity set
    - This primary key from super class entity set is also used as the primary key for this new table

Example



SSN	Name	Gender
1234	Homer	Male
5678	Marge	Female

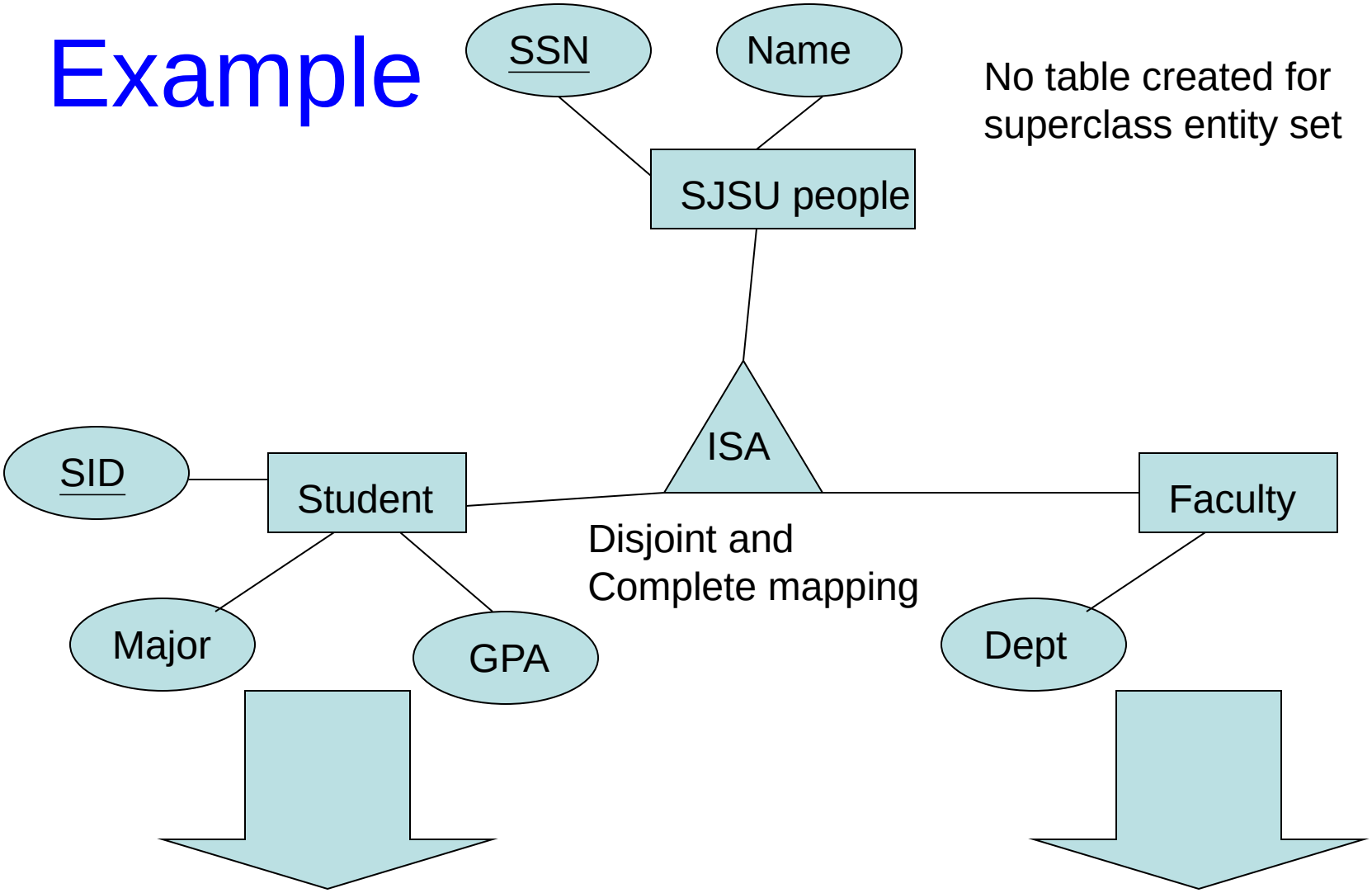
SSN	SID	Status	Major	GPA
1234	9999	Full	CS	2.8
5678	8888	Part	EE	3.6

Representing Class Hierarchy

- Two general approaches depending on disjointness and completeness
  - For disjoint **AND** complete mapping class hierarchy:
  - DO NOT create a table for the super class entity set
  - Create a table for each subclass entity set include all attributes of that subclass entity set and attributes of the superclass entity set

  - Simple and Intuitive enough, need example?

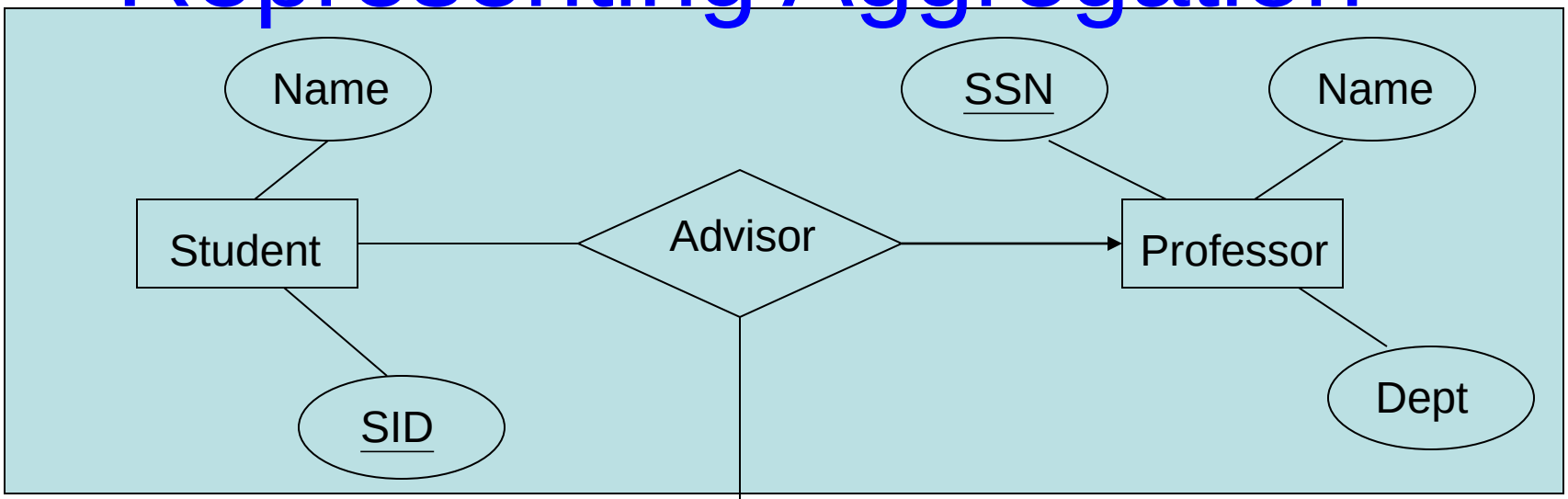
Example

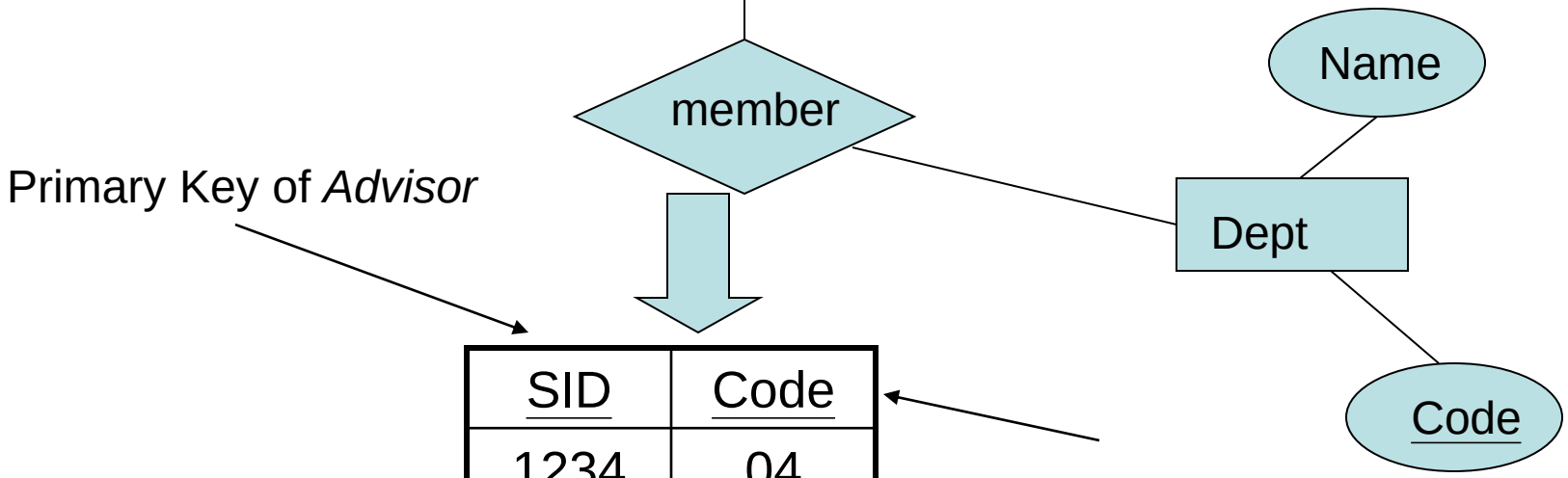


SSN	Name	SID	Major	GPA
1234	John	9999	CS	2.8
5678	Mary	8888	EE	3.6

SSN	Name	Dept
1234	Homer	C.S.
5678	Marge	Math

Representing Aggregation





SID	Code
1234	04
5678	08

Finally, we are done