

IT 775

Database Technology

ER Modeling

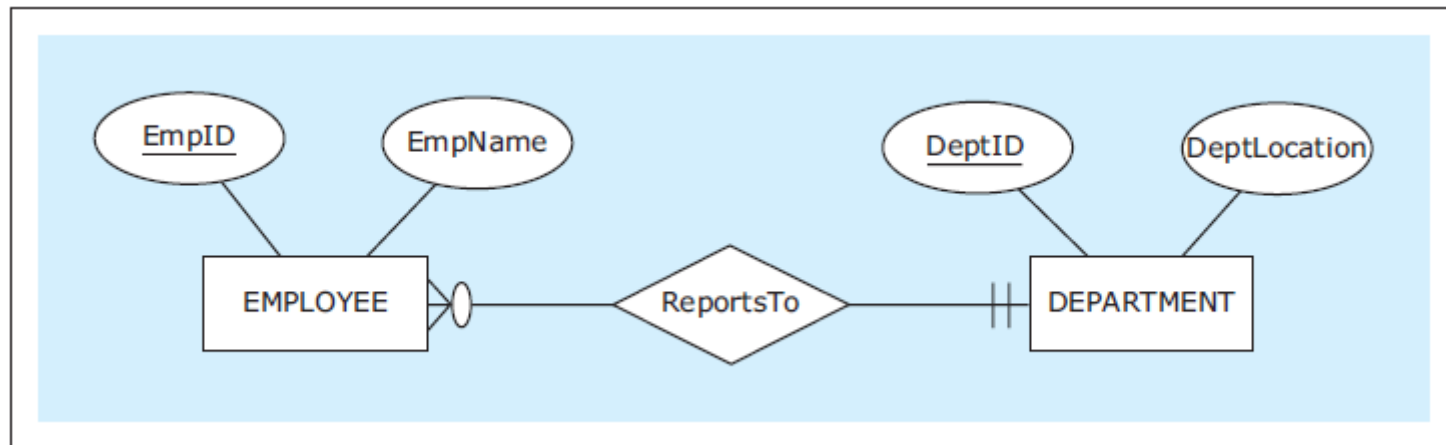
Relationships

RELATIONSHIPS

- **Relationship** - ER modeling construct depicting how entities are related
 - Within an ER diagram, each entity must be related to at least one other entity via a relationship

RELATIONSHIPS

A relationship between two entities

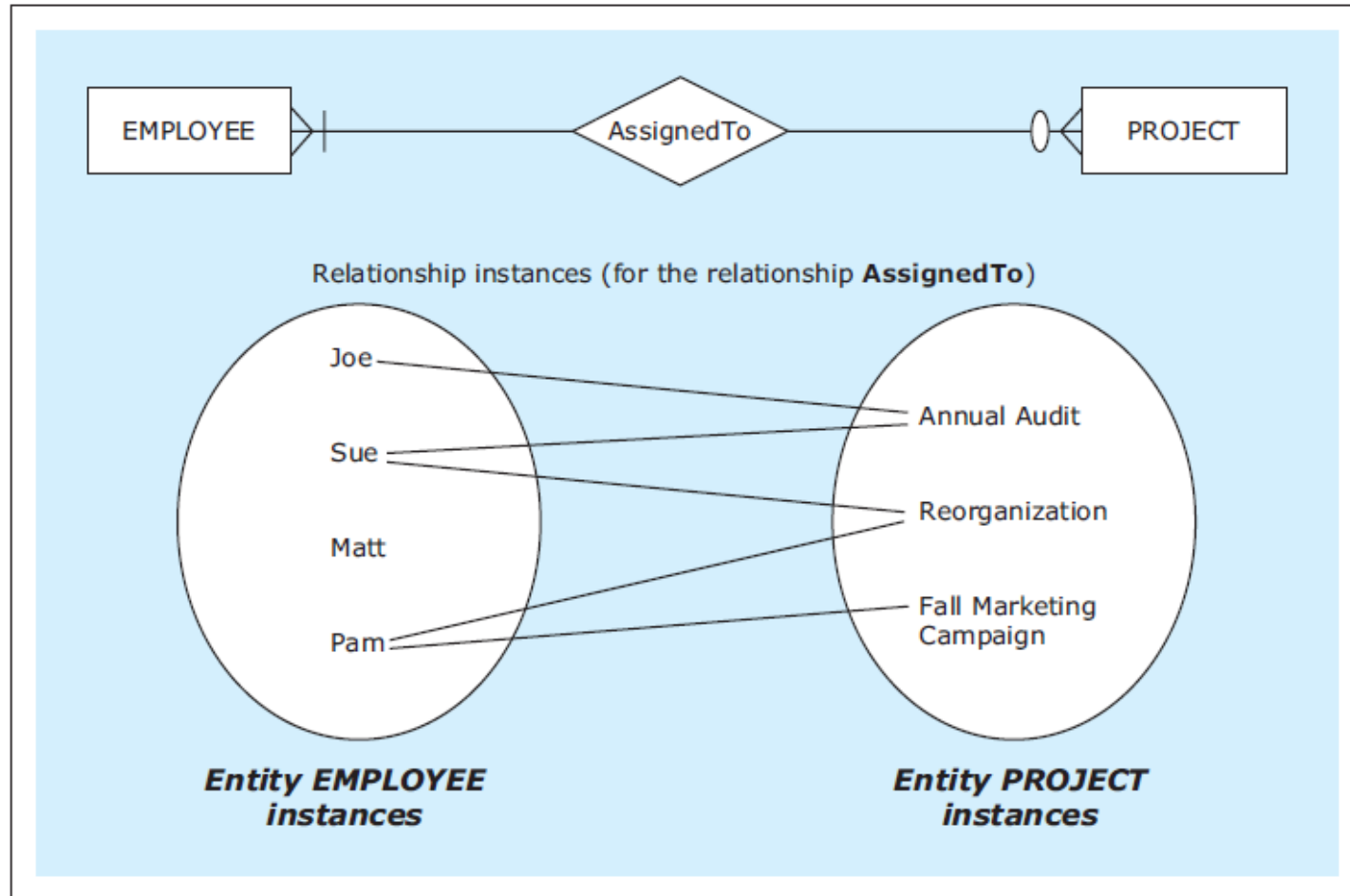


RELATIONSHIPS

- **Relationship instances** - occurrences of a relationship
 - Occur when an instance of one entity is related to an instance of another entity via a relationship
 - Relationship themselves are depicted in the ER diagrams while relationship instances are not
 - Relationship instances are eventually recorded in the database that is created based on the ER diagram

RELATIONSHIPS

A relationship and its instances



Relationships

Is a

Has a

Goes into (is a part of)

RELATIONSHIPS

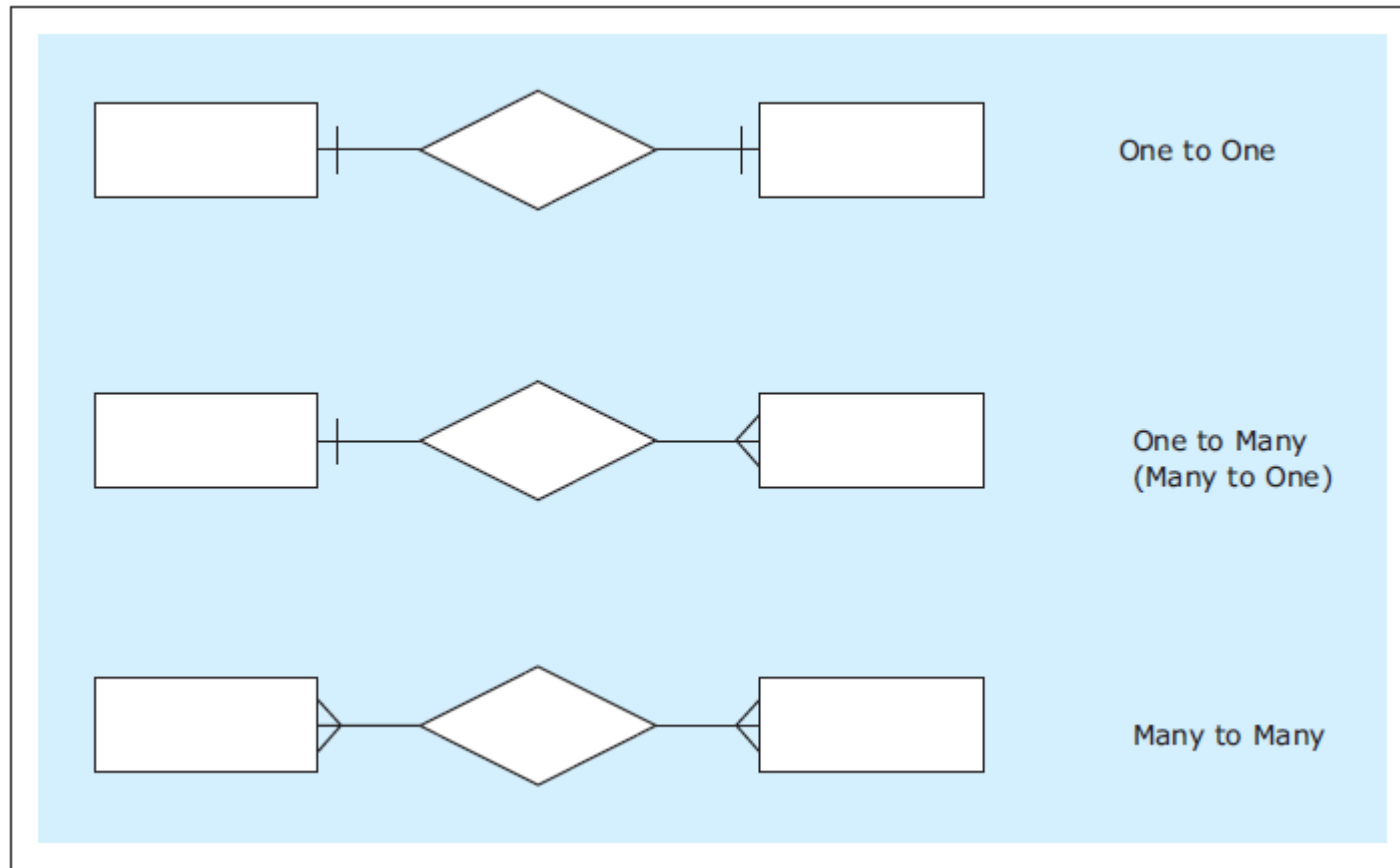
- **Cardinality constraints** - depict how many instances of one entity can be associated with instances of another entity
 - **Maximum cardinality**
 - **One** (represented by a straight bar: 1)
 - **Many** (represented by a crow's foot symbol)
 - **Minimum cardinality (participation)**
 - **Optional** (represented by a circular symbol: 0)
 - **Mandatory** (represented by a straight bar: 1)

RELATIONSHIPS

- Types of Relationships (maximum cardinality-wise)
 - One-to-One relationship (1:1)
 - One-to-Many relationship (1:M)
 - Many-to-Many relationship (M:N)

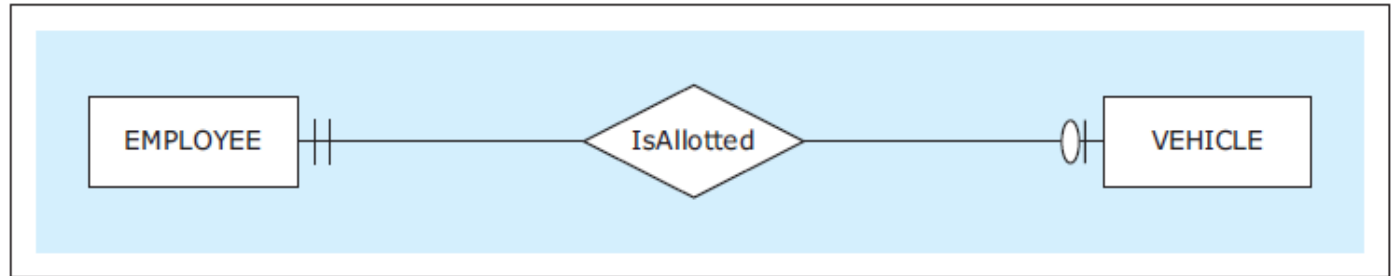
RELATIONSHIPS

Three types of relationships (maximum cardinality-wise)

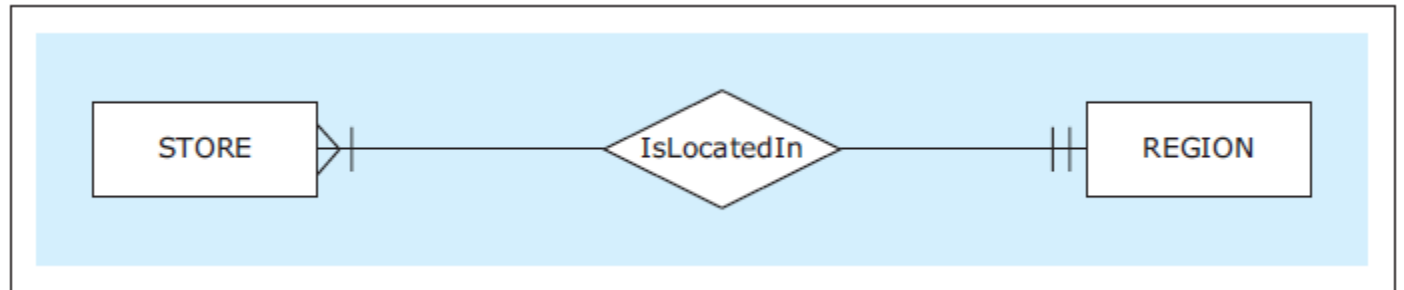


RELATIONSHIPS

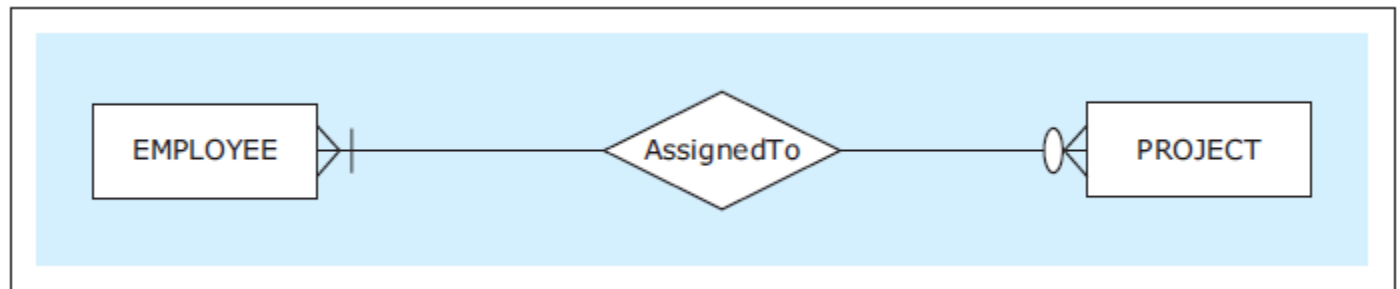
A 1:1 Relationship



A 1:M Relationship

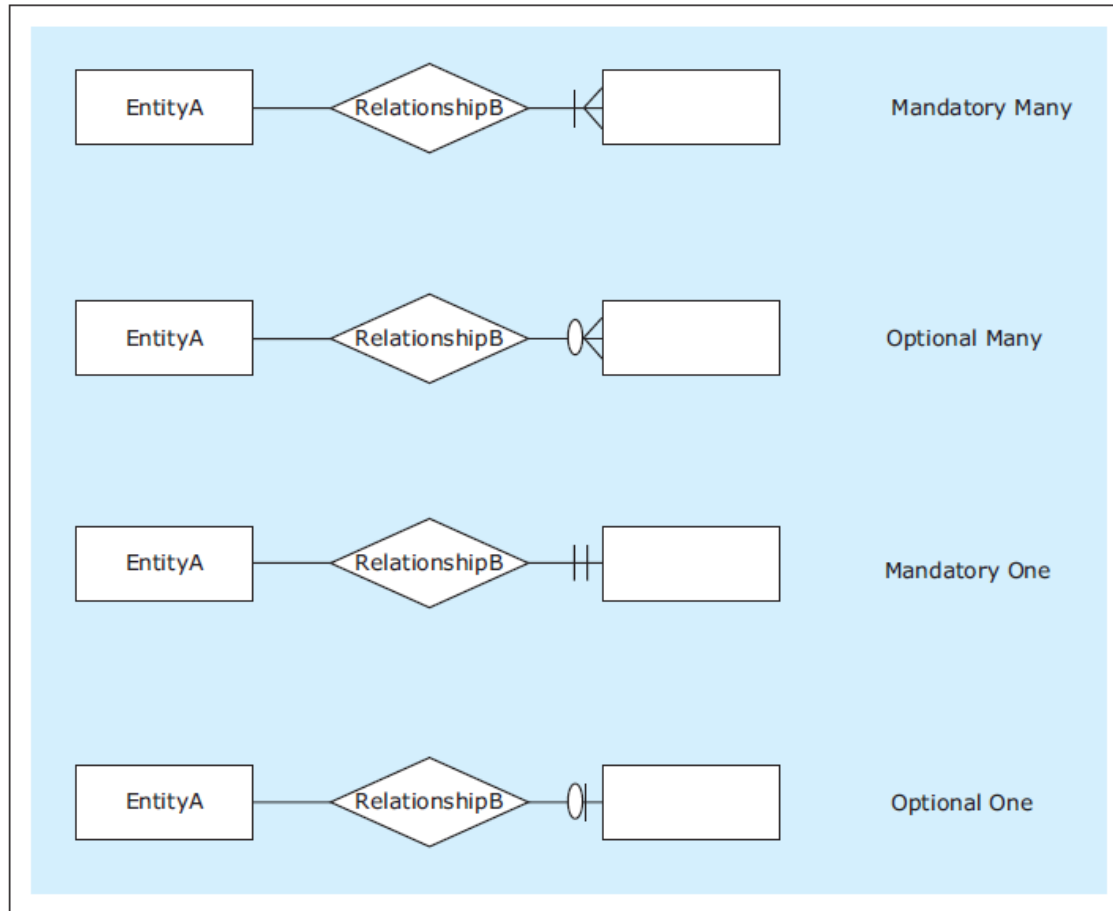


A M:N Relationship



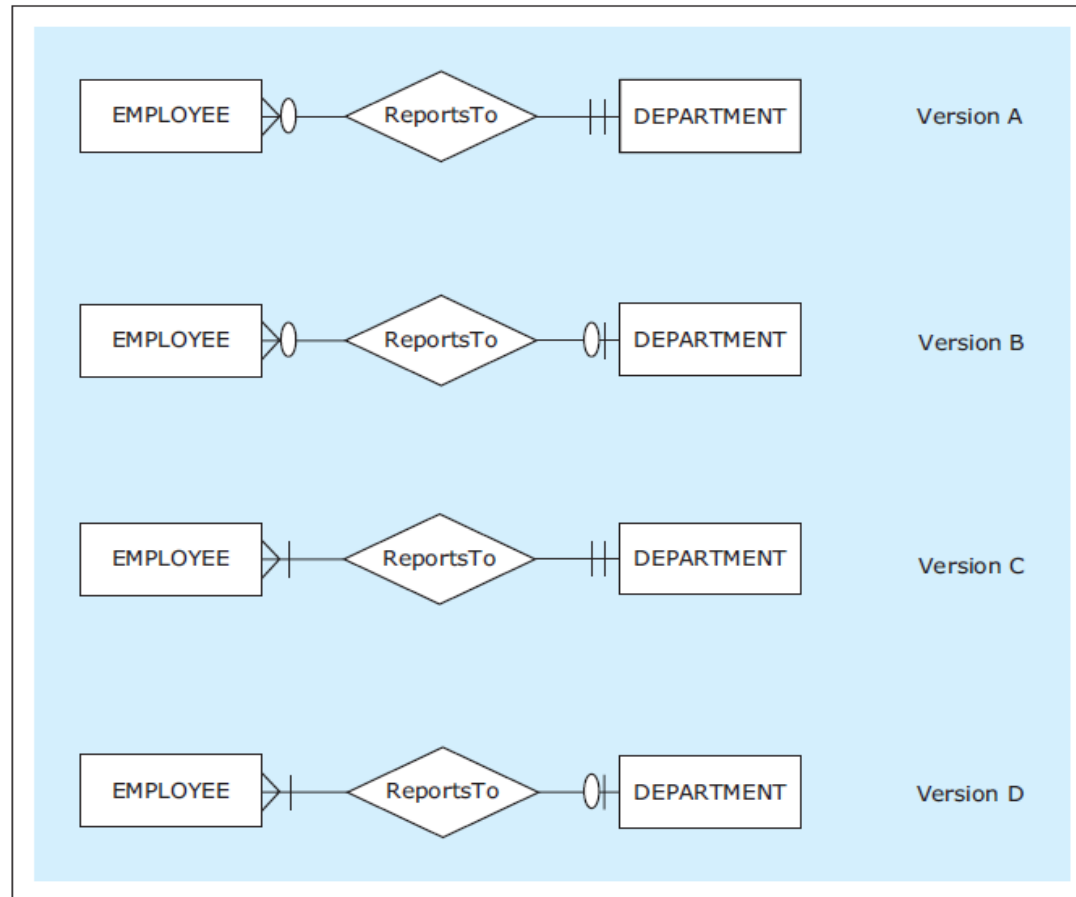
RELATIONSHIPS

Four possible cardinality constraints



RELATIONSHIPS

Several possible versions of the relationship ReportsTo

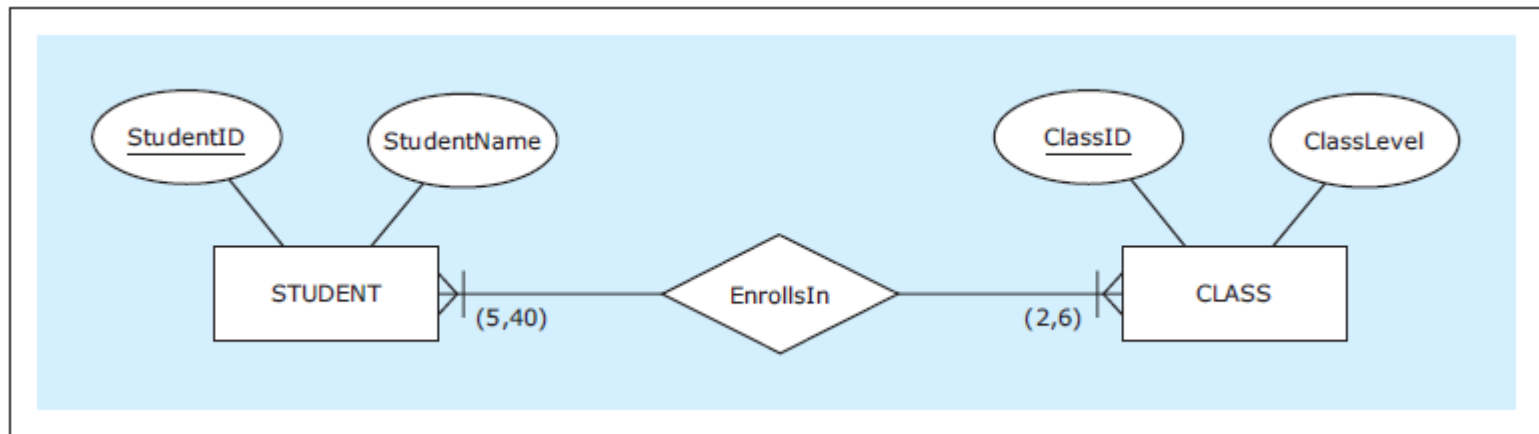


RELATIONSHIPS

- **Exact minimum and maximum cardinality in relationships**
 - In some cases the exact minimum and/or maximum cardinality in relationships is known in advance
 - Exact minimum/and or maximum cardinalities can be depicted in ER diagrams

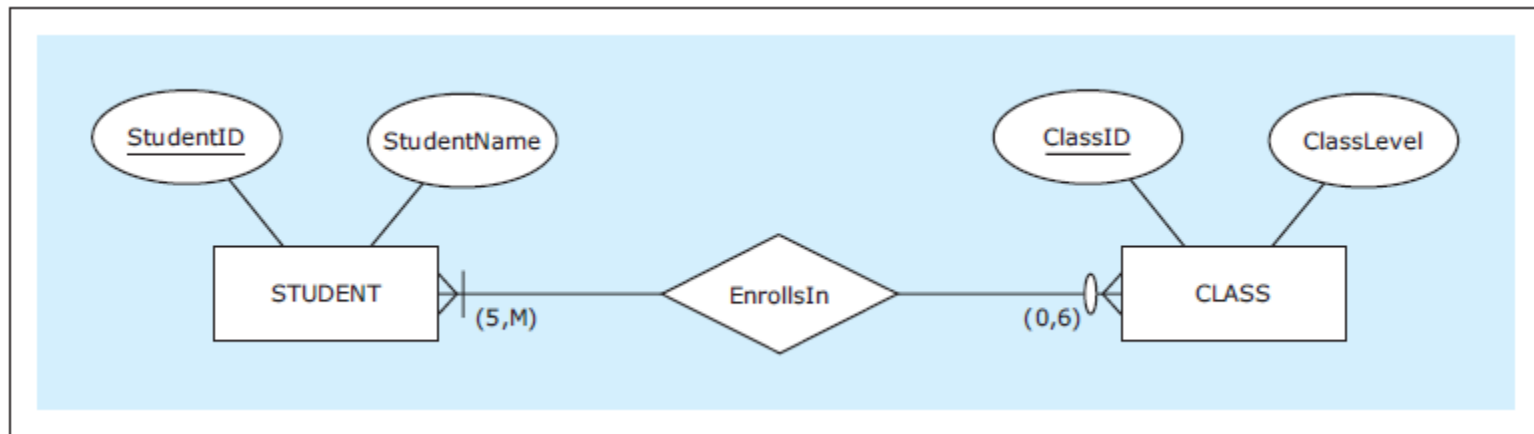
RELATIONSHIPS

A relationship with specific minimum and maximum cardinalities



RELATIONSHIPS

A relationship with a mixture of specific and non-specific cardinalities

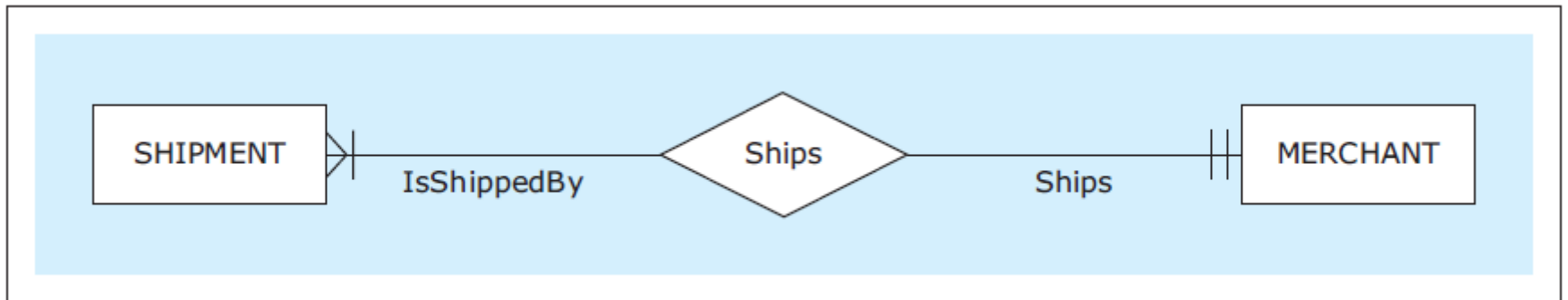


RELATIONSHIPS

- **Relationship roles** - additional syntax that can be used in ER diagrams at the discretion of a data modeler to clarify the role of each entity in a relationship

RELATIONSHIPS

A relationship with role names

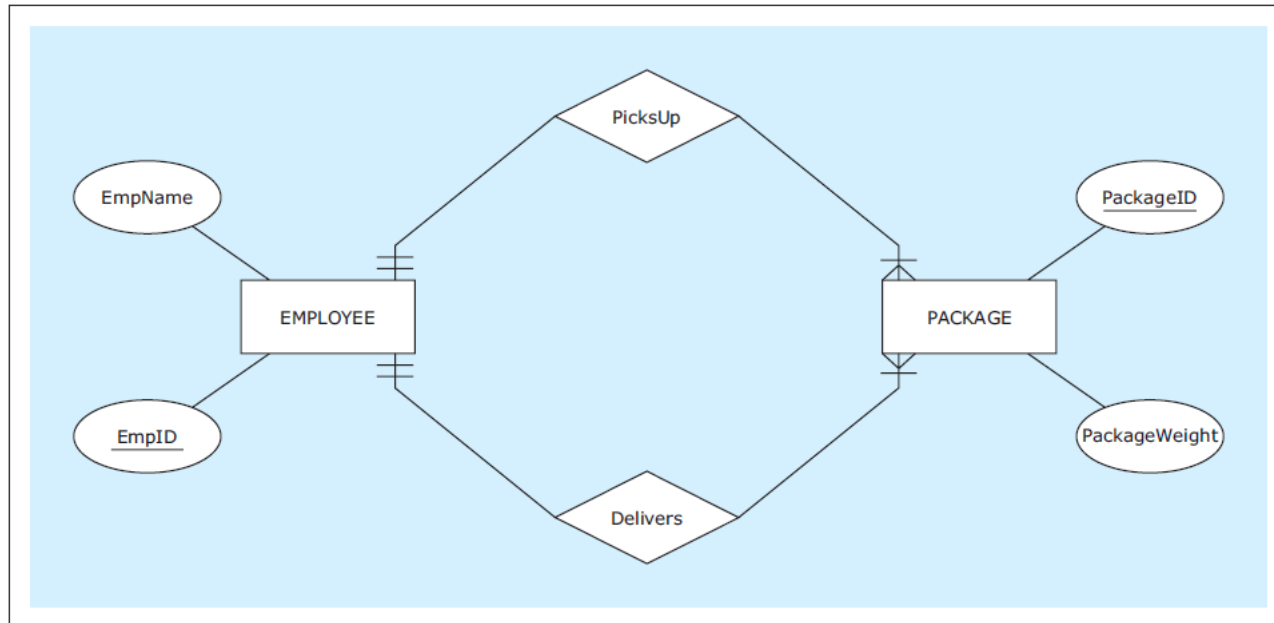


RELATIONSHIPS

- **Multiple relationships between same entities**
 - Same entities in an ER diagram can be related via more than one relationship

RELATIONSHIPS

Multiple relationships between the same entities

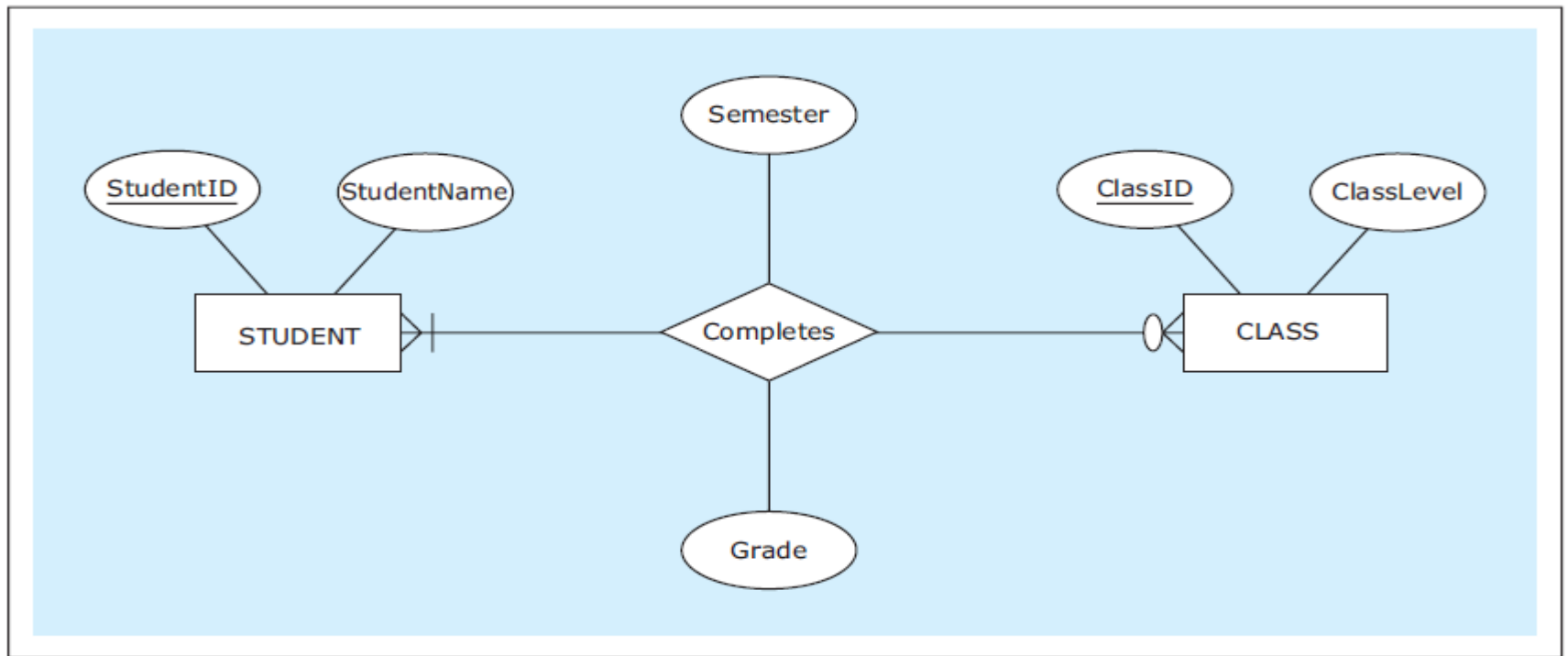


M:N RELATIONSHIPS WITH MULTIPLE INSTANCES BETWEEN THE SAME ENTITIES

- In some cases, M:N relationships can have multiple occurrences between the same instances of involved entities
 - The following examples illustrates such cases

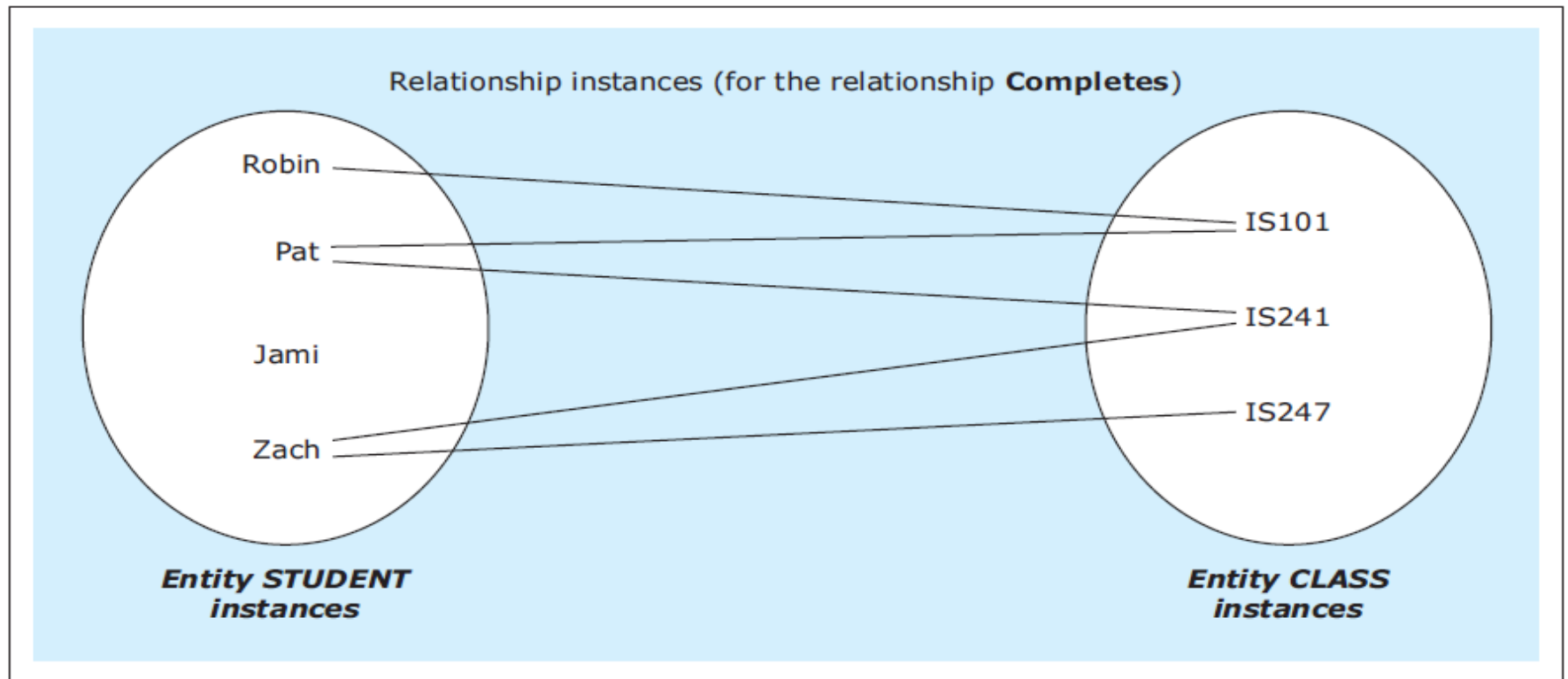
M:N RELATIONSHIPS WITH MULTIPLE INSTANCES BETWEEN THE SAME ENTITIES

An ER diagram for an M:N relationship depicting students completing classes



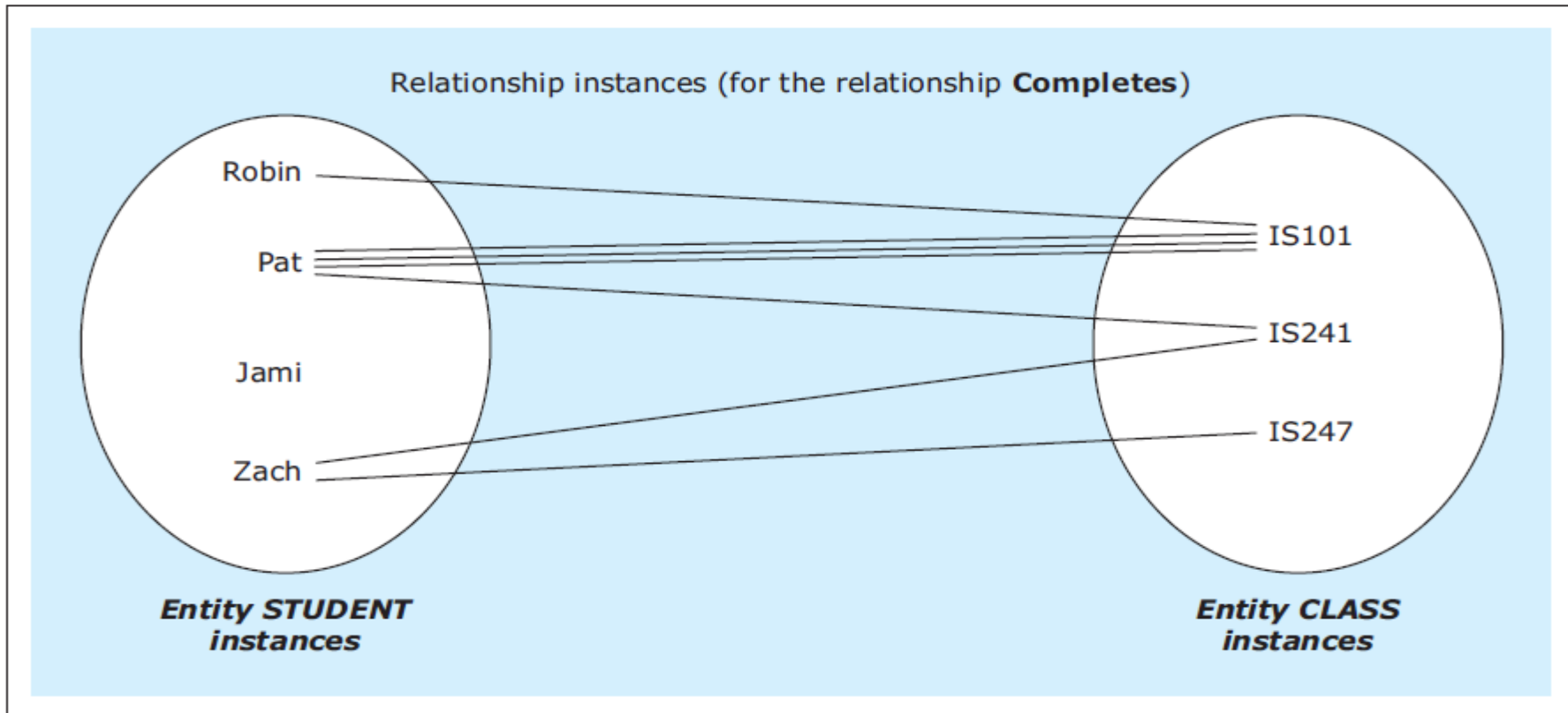
M:N RELATIONSHIPS WITH MULTIPLE INSTANCES BETWEEN THE SAME ENTITIES

Instances of the M:N relationship Completes



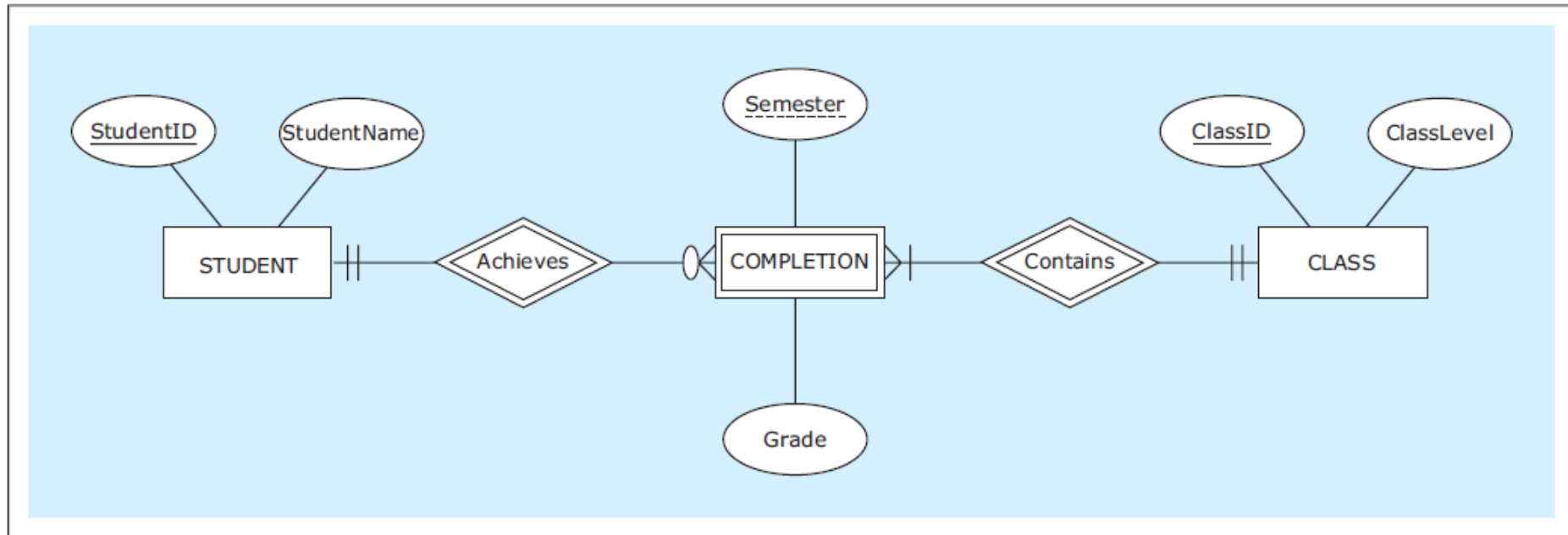
M:N RELATIONSHIPS WITH MULTIPLE INSTANCES BETWEEN THE SAME ENTITIES

Instances of the M:N relationship **Completes** with an additional requirement



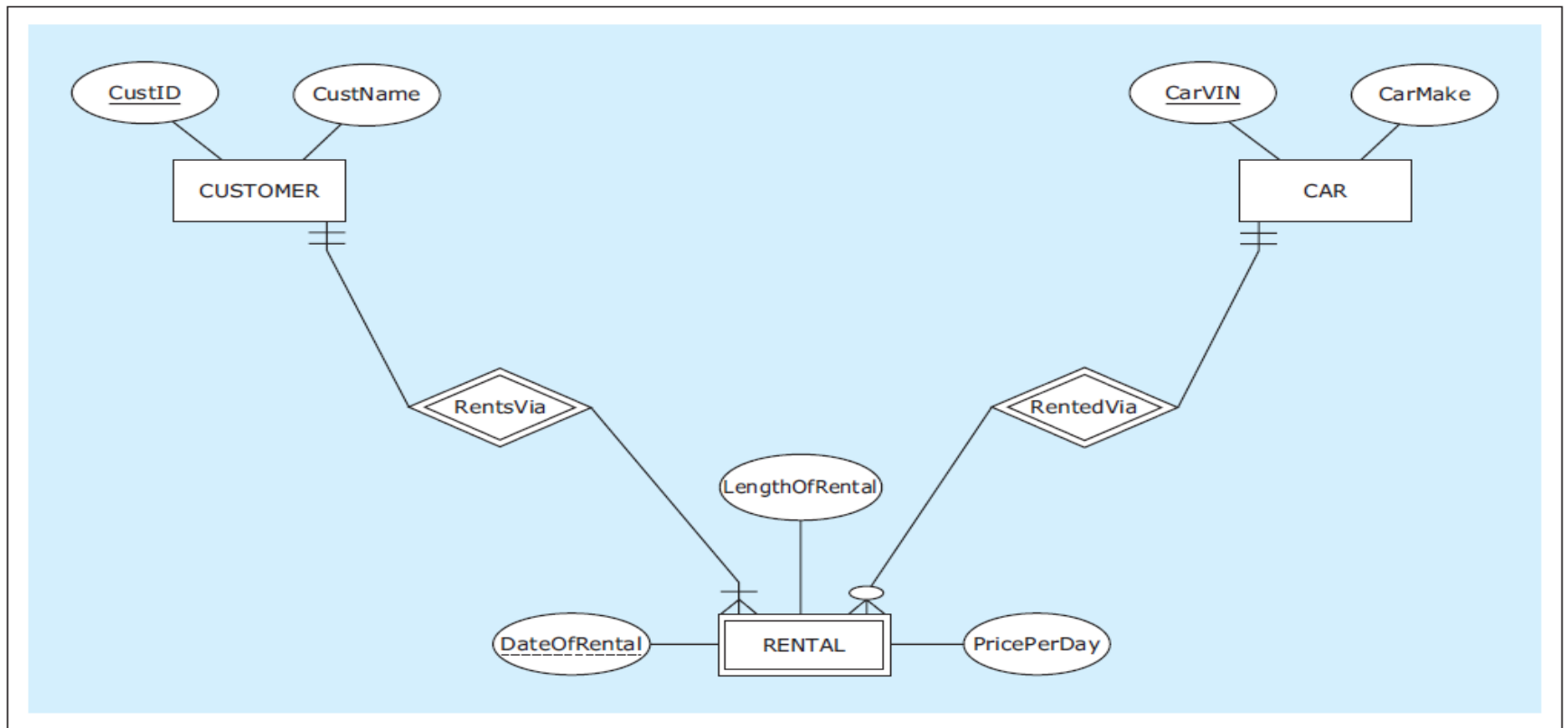
M:N RELATIONSHIPS WITH MULTIPLE INSTANCES BETWEEN THE SAME ENTITIES

An ER diagram for an M:N relationship represented as a weak entity



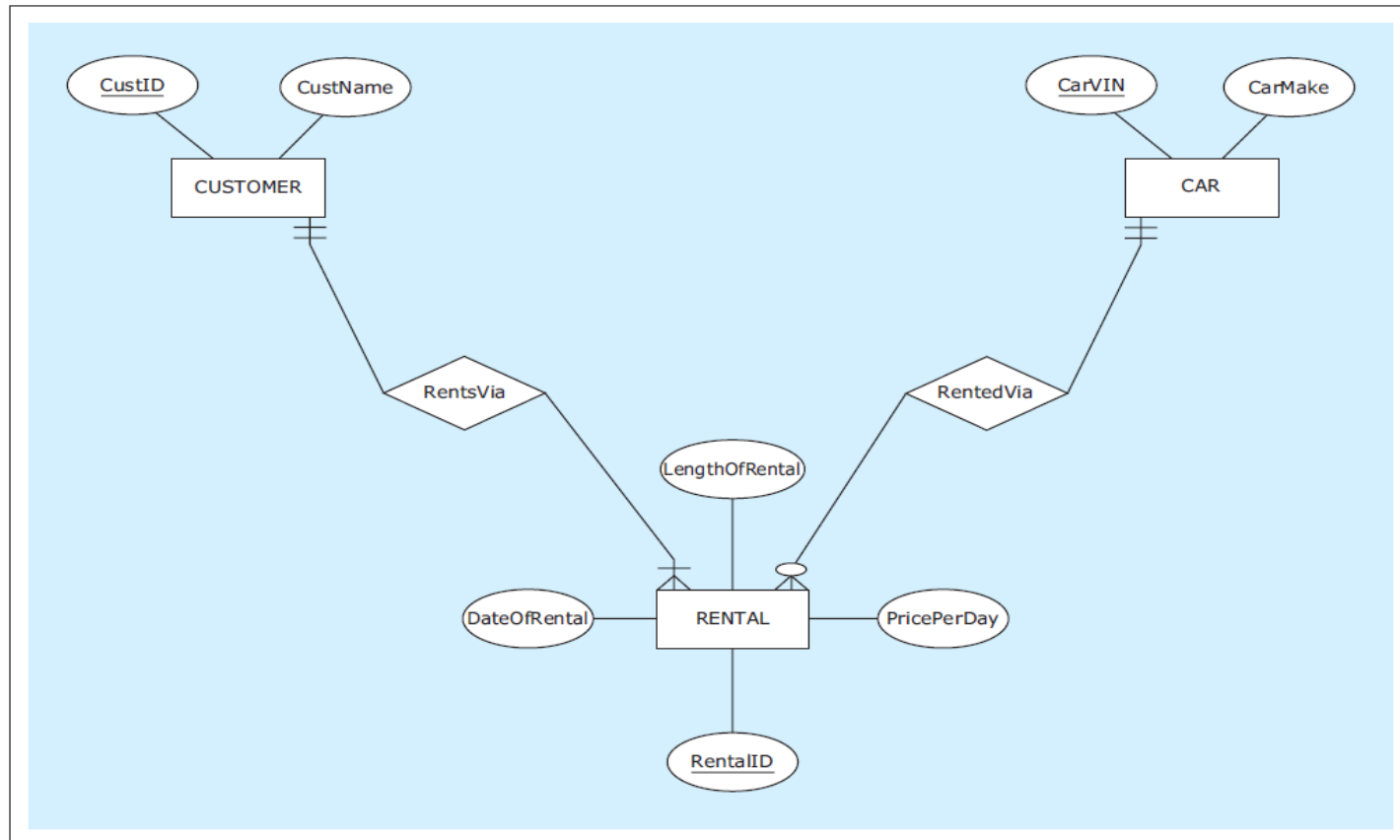
M:N RELATIONSHIPS WITH MULTIPLE INSTANCES BETWEEN THE SAME ENTITIES

Another M:N relationship represented as a weak entity



M:N RELATIONSHIPS WITH MULTIPLE INSTANCES BETWEEN THE SAME ENTITIES

A regular entity, instead of an M:N relationship represented as a weak entity



Another ER diagram example: HAFH Realty Company Property Management Database

