

Database Design

Identifying Relationships



ACADEMY

Objectives

This lesson covers the following objectives:

- Interpret and describe relationship optionality
- Interpret and describe relationship cardinality
- Relate (connect or join) entities by applying the rules of cardinality and optionality

Purpose

Being able to identify the relationships between entities makes it easier to understand the connections between different pieces of data.

Relationships help you see how different parts of a system affect each other. For example, the entities STUDENT and COURSE are related to each other.

To accurately model the business, the relationships between entities are as important as the entities themselves.

Relationships in Families

What is the relationship between you and your aunt, your uncle, your cousins, your grandmother, etc.? What would society be like if it did not categorize relationships between people, but instead just identified people by name? How could you explain to someone that Jenny was your cousin?

Relationships in Families (cont.)

It could be a long and potentially confusing introduction, something like, “This is Jenny, the child of the woman who has the same parents as my parent who is a woman,” or “This is Jenny, my mother’s sister’s child,” or “This is Jenny, my aunt’s child,” or the easiest of all, “This is Jenny, my cousin.”

Notice that we still must use a basic relationship even in the longest introduction -- that of child to parent. Without that relationship, it would be very difficult to introduce anyone beyond giving his name!

Relationships in Data Models

Relationships:

- Represent something of significance or importance to the business
- Show how entities are related to each other
- Exist only between entities (or one entity and itself)
- Are bi-directional
- Are named at both ends
- Have optionality
- Have cardinality

What is Optionality in a Relationship?

Relationships are either mandatory or optional. Consider the two entities EMPLOYEE and JOB. Based on what you know about instances of the entities, you can determine optionality by answering two questions:

- Must every employee have a job? In other words, is this a mandatory or optional relationship for an employee?
- Must every job be done by an employee? In other words, is this a mandatory or optional relationship for a job?

What is Cardinality in a Relationship?

Cardinality measures the quantity of something. In a relationship, it determines the degree to which one entity is related to another by answering the question, “How many?”

For example:

- How many jobs can one employee hold? One job only? Or more than one job?
- How many employees can hold one specific job? One employee only? Or more than one employee?

What is Cardinality in a Relationship? (cont.)

Note: The cardinality of a relationship only answers whether the number is singular or plural; it does not answer with a specific plural number.

Optionality and Cardinality

Examples:

Each **EMPLOYEE** must hold one and only one **JOB**

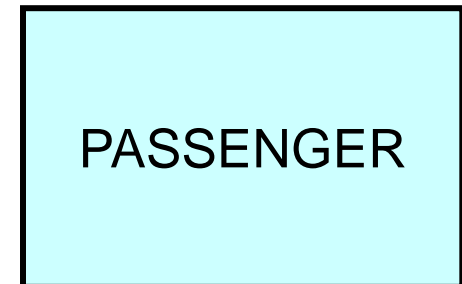
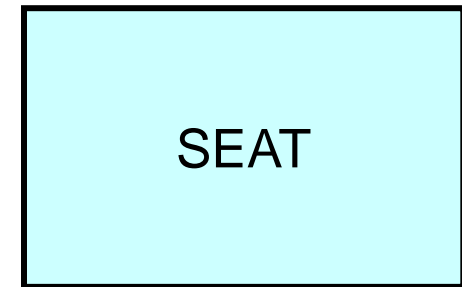
Each **JOB** may be held by one or more **EMPLOYEEs**

Each **PRODUCT** must be classified by one and only one **PRODUCT TYPE**

Each **PRODUCT TYPE** may classify one or more **PRODUCTs**

Relationships

- Each SEAT may be sold to one or more PASSENGERs
- Each PASSENGER may purchase one SEAT
- SEAT is sold to a PASSENGER (or PASSENGERs -- hence, overbooking)
- PASSENGER purchases or books a SEAT



Business Scenario 1

What are the relationships in the following business scenario?

“We like to classify all of our music—each song or soundtrack—by type. The different types are rock, jazz, country, classical, pop, new age, etc. We can add new types as the need arises.

RELATIONSHIP

SONG
(music/soundtrack) is
classified by **TYPE**

TYPE is a classification
for **SONG**

Business Scenario 1 (cont.)

In fact, we recently added a new type for rap music. We realize that a song can really be classified under more than one type, but for our purposes, we select only one main classification type for each song."

RELATIONSHIP

SONG
(music/soundtrack) is
classified by **TYPE**

TYPE is a classification
for **SONG**

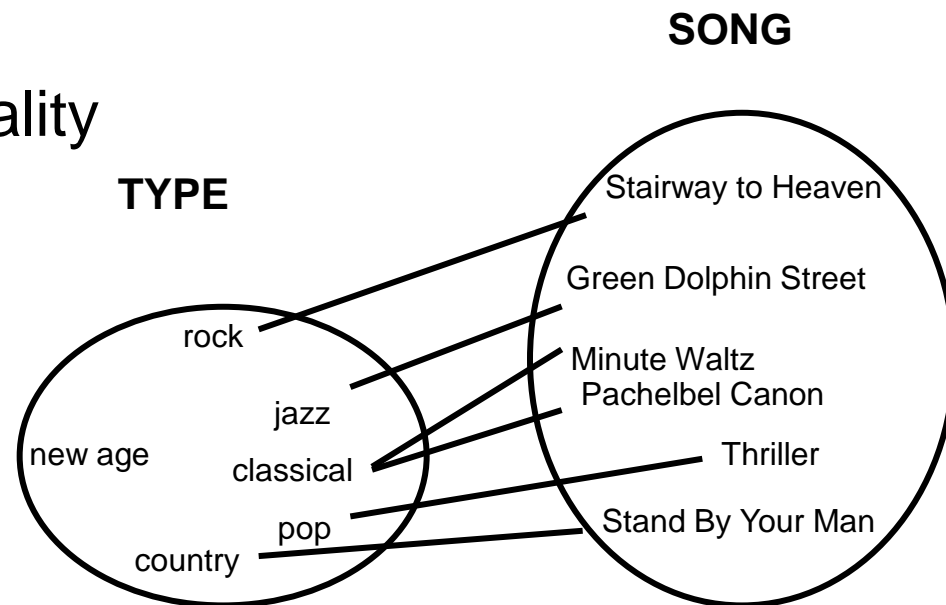
Business Scenario 1 (cont.)

Entity SONG has a TYPE:
thus, it has a relationship
which includes both optionality
and cardinality.

Optionality = required or
optional?

Each SONG must be
classified by one (and only
one) TYPE.

Each TYPE may be a
classification for one or more
SONGs.

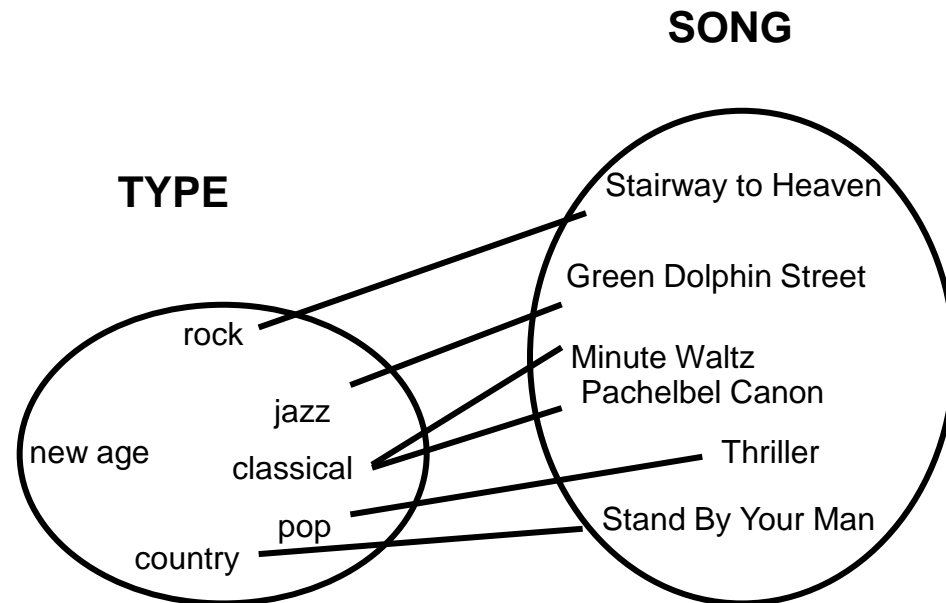


Business Scenario 1 (cont.)

Cardinality = How many, or to what degree?

Each SONG must be classified by one (and only one) TYPE.

Each TYPE may be a classification for one or more SONGS.

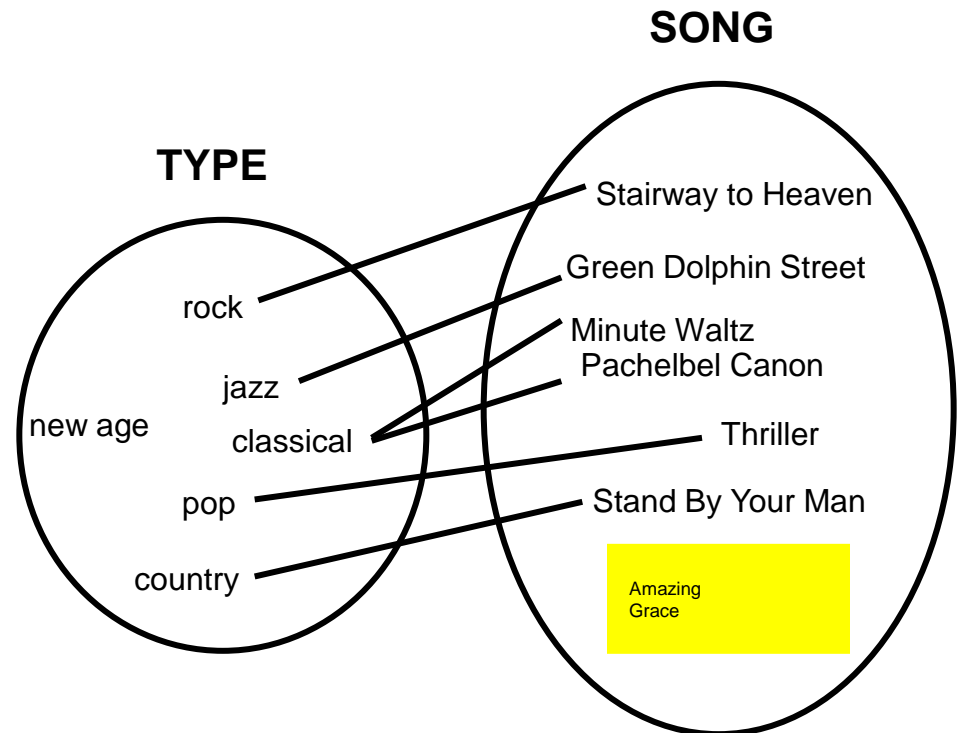


Business Scenario 1 (cont.)

SONG has a TYPE

What if the TYPE for a specific SONG does not exist?

If the business rules state that every SONG must have a TYPE, then an additional TYPE needs to be added.

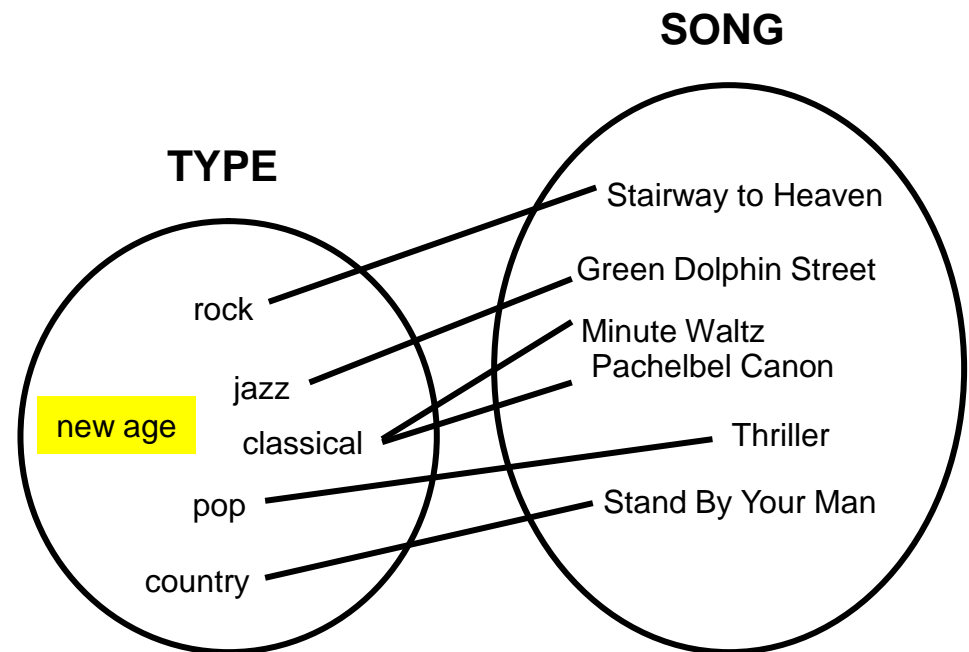


Business Scenario 1 (cont.)

SONG has a TYPE

Can you have a TYPE
with no SONG?

Why would you have a
TYPE with no SONG?

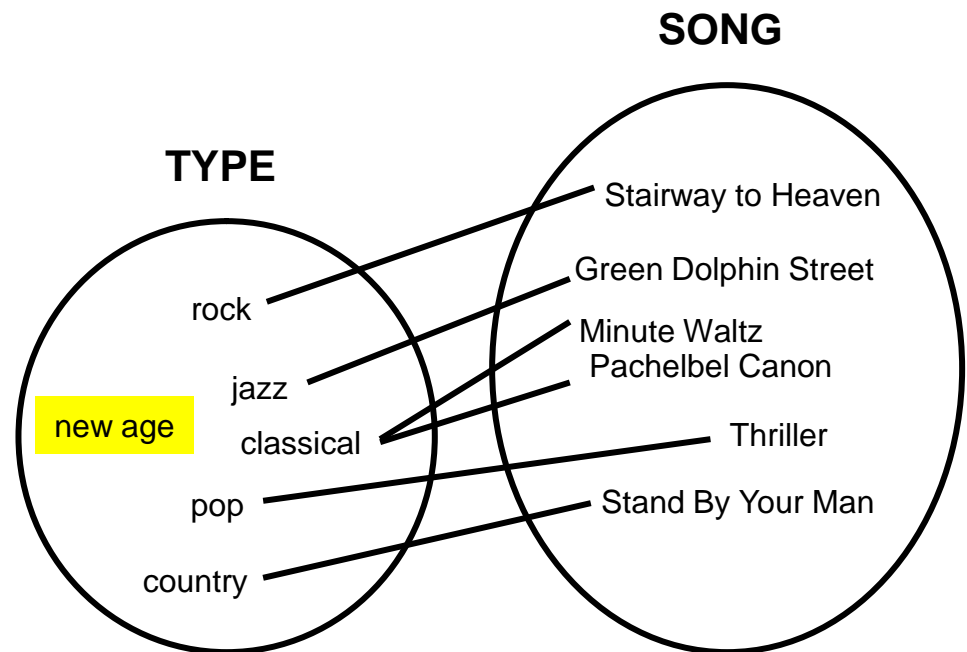


Business Scenario 1 (cont.)

SONG has a TYPE

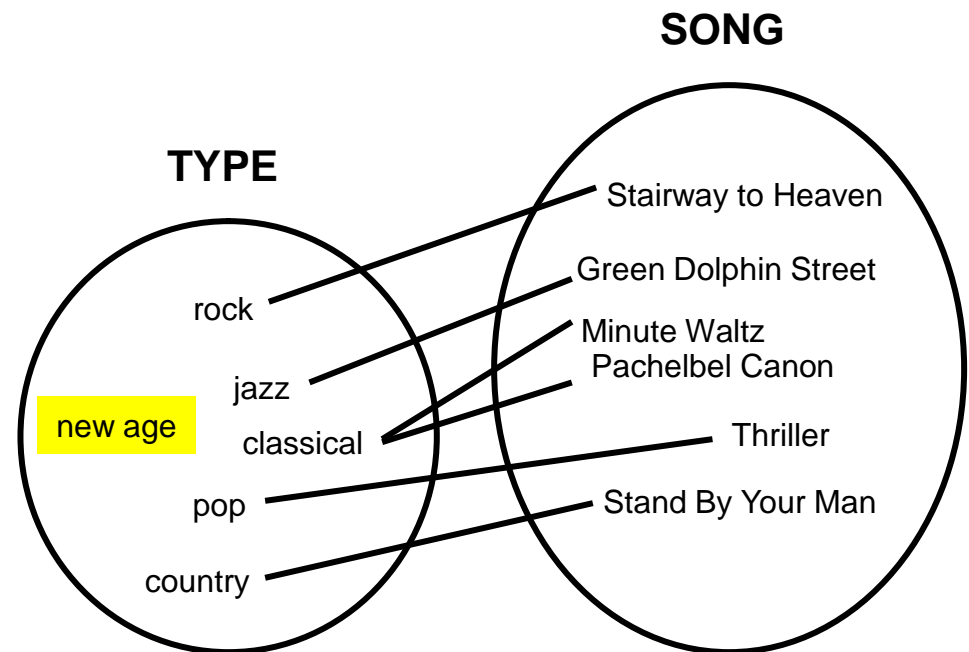
How many TYPEs can
a SONG belong to?

The rules of the
business determine
the cardinality.



Business Scenario 1 (cont.)

If the business rules state that a SONG may belong to more than one TYPE, the cardinality could be stated as: Each SONG must be classified by one or more TYPEs.



Business Scenario 2

What are the relationships in the following business scenario?

“In our restaurant, a customer walks up to the counter and places his order. A customer can order for himself only, or for himself and others. For example, a mother orders for herself and her children.

RELATIONSHIP

**CUSTOMER places
ORDERS**

**An ORDER is placed
by one CUSTOMER**

Business Scenario 2 (cont.)

We consider the mother to be the customer who owns the order and is responsible for payment. Over a period of time, a customer can place as many orders as he wants.”

RELATIONSHIP

**CUSTOMER places
ORDERS**

**An ORDER is placed
by one CUSTOMER**

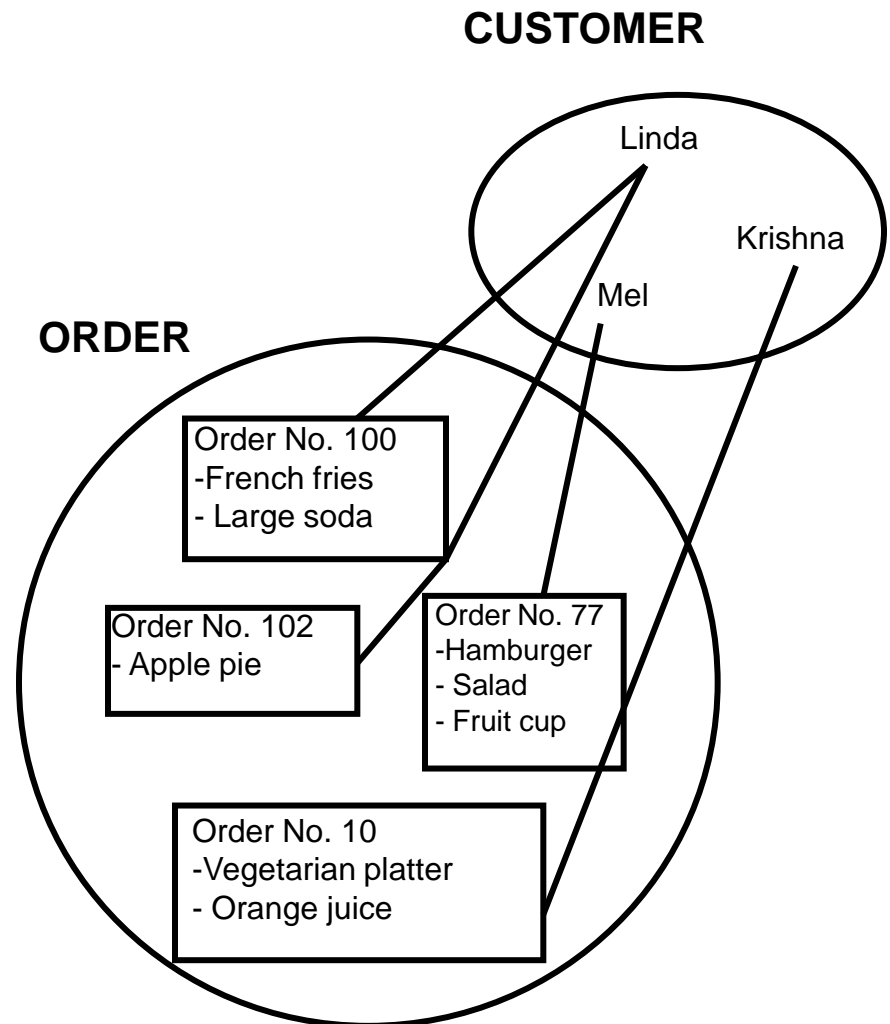
Business Scenario 2 (cont.)

CUSTOMER has
ORDERs: optionality
and cardinality

Optionality = Must or
may?

Each ORDER must be
placed by one (and
only one) CUSTOMER.

Each CUSTOMER
must place one or more
ORDERs.

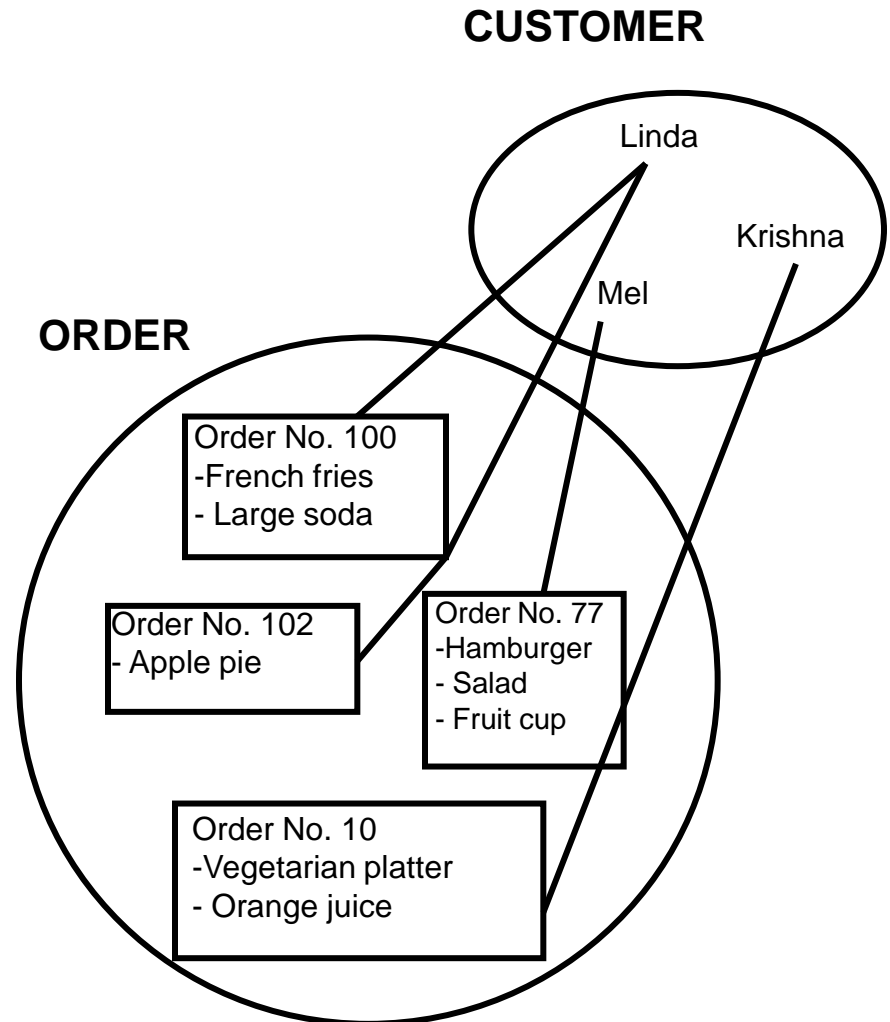


Business Scenario 2 (cont.)

Cardinality = How many?

Each ORDER must be placed by one (and only one) CUSTOMER.

Each CUSTOMER must place one or more ORDERS.



Business Scenario 3

A relationship can join one entity to itself. Examine the following scenario:

“We need to keep track of our employees and their managers. Every employee has one manager, including the managing director who manages him/herself. Each manager can manage several employees.”

Business Scenario 3 (cont.)

Since managers are also employees, both are listed in the same entity: EMPLOYEE.

RELATIONSHIP

An EMPLOYEE manages EMPLOYEEs

An EMPLOYEE is managed by one EMPLOYEE

Terminology

Key terms used in this lesson included:

- Cardinality
- Optionality
- Relationship

Summary

In this lesson, you should have learned how to:

- Interpret and describe relationship optionality
- Interpret and describe relationship cardinality
- Relate (connect or join) entities by applying the rules of cardinality and optionality