Exercises

E2.1 Create an example of an entity with several attributes.

E2.2 Create requirements and the ER diagram for a scenario with two entities (both with several attributes) involved in the following relationship:

- **E2.2a** 1:M relationship, where participation on the 1 side is mandatory and participation on the M side is optional.
- **E2.2b** 1:M relationship, where participation on the 1 side is optional and participation on the M side is mandatory.
- **E2.2c** 1:M relationship, where participation on both sides is mandatory.
- **E2.2d** 1:M relationship, where participation on both sides is optional.
- **E2.2e** M:N relationship, where participation on one side is mandatory and participation on the other side is optional.
- **E2.2f** M:N relationship, where participation on both sides is mandatory.
- **E2.2g** M:N relationship, where participation on both sides is optional.
- **E2.2h** 1:1 relationship, where participation on one side is mandatory and participation on the other side is optional.
- **E2.2i** 1:1 relationship, where participation on both sides is mandatory.
- **E2.2j** 1:1 relationship, where participation on both sides is optional.

E2.3 Create requirements and the ER diagram for a scenario with two entities (both with several attributes) involved in a many-to-many relationship that has a relationship attribute.

E2.4 Create an example of an entity with a composite attribute.

E2.5 Create an example of an entity with a composite unique attribute.

E2.6 Create an example of an entity with candidate keys (multiple unique attributes).

E2.7 Create an example of an entity with a multivalued attribute.

E2.8 Create an example of an entity with a derived attribute.

E2.9 Create an example of an entity with an optional attribute.

E2.10 Create requirements and the ER diagram for a scenario with two entities (both with several attributes) involved in a relationship with exact minimum and maximum cardinalities.

E2.11 Create requirements and the ER diagram with several attributes for the scenario with an entity involved in a unary relationship.

E2.12 Create requirements and the ER diagram for the scenario with two entities (both with several attributes) involved in two separate relationships.

E2.13 Create requirements and the ER diagram for the scenario with two entities (both with several attributes), one of which is a weak entity and the other its owner entity, involved in an identifying relationship.

Mini Cases

MC1 Investco Scout

Investco Scout is an investment research company. Create the ER diagram for the Investco Scout Funds Database, based on the following requirements.

- *The Investco Scout Funds Database will keep track of investment companies, the mutual funds they manage, and securities contained in the mutual funds.*
- *For each investment company, Investco Scout will keep track of a unique investment company identifier and a unique investment company name as well as the names of multiple locations of the investment company.*
- *For each mutual fund, Investco Scout will keep track of a unique mutual fund identifier as well as the mutual fund name and inception date.*
- *For each security, Investco Scout will keep track of a unique security identifier as well as the security name and type.*
- *Investment companies can manage multiple mutual funds. Investco Scout does not keep track of investment companies that do not manage any mutual funds. A mutual fund is managed by one investment company.*
- *A mutual fund contains one or many securities. A security can be included in many mutual funds. Investco Scout keeps track of securities that are not included in any mutual funds.*
- *For each instance of a security included in a mutual fund, Investco Scout keeps track of the amount included.*

MC2 Funky Bizz

Funky Bizz is a rental business that rents musical instruments to bands. Create the ER diagram for the Funky Bizz Operations Database, based on the following requirements.

- *The Funky Bizz Operations Database will keep track of instruments, bands, repair technicians, and shows.*
- *For each instrument, Funky Bizz will keep track of a unique instrument serial number as well as the instrument model and brand, the year when the instrument was made, and the age (measured in years) of the instrument.*
- *The customers of Funky Bizz are bands. For each band, Funky Bizz will keep track of the unique band name and unique band identifier as well as the band's address, contact person's name, and multiple phone numbers.*
- *Repair technicians maintain the instruments. For each technician, Funky Bizz will keep track of a unique SSN as well as a name, address, and multiple phone numbers.*
- *Funky Bizz will record information about shows that its customer bands perform in. For each show, it will keep track of a unique show identifier composed of the show venue name and date. For*

each show, it will also keep track of show type and show name (a show may or may not have a name).
- A band does not have to rent any instruments, but may rent up to 30. Each instrument may be rented by one band or by no bands at all.
- A repair technician may repair many or no instruments, and an instrument may be repaired by many or no technicians.
- A band may perform in many shows, but does not have to perform in any. Each show must have at least one band performing, but may have many bands performing.
- For each band, Funky Bizz keeps track of the number of shows that each band performs in.

MC3 Snooty Fashions

Snooty Fashions is an exclusive custom fashion designer business. Create the ER diagram for the Snooty Fashions Operations Database based on the following requirements.

The Snooty Fashions Operations Database will keep track of the following:

- For each designer: a unique designer identifier and unique SSN as well as the name (composed of first and last name)
- For each customer: a unique customer's identifier as well as his or her name and multiple phone numbers
- For each tailoring technician: a unique SSN as well as his or her name (composed of first and last name)
- For each outfit: a unique outfit's identifier as well as the outfit's planned date of completion and its unreasonable price
- For each fashion show: a unique show identifier as well as the date of the show and location
- Each designer designs many outfits. Each outfit has only one designer.
- Each outfit is sold (in advance) to exactly one customer. Customers can buy one or many outfits (Snooty Fashions will not keep track of customers that have not made any purchases yet).
- Each tailoring technician must work on at least one outfit but can work on many. Each outfit has at least one tailoring technician working on it but can have many.
- Snooty Fashions will keep track of the date when a tailoring technician started working on a particular outfit.
- Each designer can participate in a number of fashion shows, but does not have to participate in any. Each fashion show can feature one or two Snooty Fashions designers (Snooty Fashions will not keep track of fashion shows that do not feature Snooty Fashions designers).

MC4 Signum Libri

Signum Libri (SL) is a publishing company. Create the ER diagram for the SL Operations Database based on the following requirements.

SL Operations Database will keep track of the following:

- For each book SL publishes: a book name, genre, date of publication, and number of pages
- For each writer: a unique writer identifier as well as the writer's name
- For each agent: a unique agent identifier as well as the agent's name
- For each editor: a unique editor identifier as well as the editor's name
- Each SL book is written by one writer, and each writer can write many SL books. SL will not keep track of writers who did not write a book for SL. All books written by the same writer have a different book name. However, two writers can write two different books with the same book name.
- Each writer is represented by one agent. Each agent represents at least one writer, but can represent many.
- Each book has one editor. Each editor edits at least one book, but can edit many books.
- Each editor can mentor one or more other editors, but does not have to mentor any. Each editor can have at most one mentor editor, but does not have to have any.

MC5 ExoProtect

ExoProtect is an insurance company. Write out all requirements for the ER diagram for the ExoProtect Employees' Computers Database shown in Figure 2.58.

MC6 Jones Dozers

Jones Dozers is a construction equipment company. Write out all requirements for the ER diagram for the Jones Dozers Sales and Rentals Database shown in Figure 2.59.

MC7 Midtown Memorial

Midtown Memorial is a hospital. Write out all requirements for the ER diagram for the Midtown Memorial Patients Drug Dispense Database shown in Figure 2.60.