

Exercise 1:

Given the following sentences:

- A directory contains files.
- A room contains walls.
- A bank account may belong to a natural person or a legal entity.
- Algeria borders Morocco. Canada borders the United States.
- A person plays in a team for a certain period of time.
- A polygon is made up of points. A point has an x-coordinate and a y-coordinate.
- People use a language for a project.

Develop the corresponding class diagrams by choosing the appropriate type of relationship.

Exercise 2:

Given the classes Mare, Stallion, Colt, Filly, Horse, Male Horse, and Female Horse, as well as the father and mother associations.

Establish the class hierarchy by including the two associations.

Use the constraints {incomplete}, {complete}, {disjoint}, and {overlapping}.

Introduce the class Herd. Establish the composition association between this class and the previously introduced classes.

Exercise 3:

A geometric figure is composed of simple or composite figures. A composite figure is made up of several figures, and a simple figure can be a point, a line, or a circle. A figure can be drawn or translated.

Develop the class diagram for this situation.

Exercise 4:

A school is composed of students, teachers, and departments. Each teacher belongs to a single department, and each department has a head (a teacher). A teacher receives a salary. He teaches one or several subjects belonging to the same field (discipline or specialty). Students have a grade for each subject. The system must allow adding a person or a department, calculating a student's average grade, and checking a teacher's salary record.

Provide a class diagram to model the school problem.

Exercise 5:

A hotel is composed of at least two rooms. Each room has a bathroom area: either a shower or a bathtub. A hotel hosts people. It may employ staff, and it must necessarily be managed by a director. Only the first name and last name of employees, directors, and occupants are known. Some people are children and others are adults (employing children is forbidden). A hotel has the following characteristics: an address, a number of rooms, and a category. A room is characterized by the number of beds it contains, its price, and its number.

We want to be able to know who occupies which room on which date. For each day of the year, we want to be able to calculate the rent of each room based on its price and its occupancy (the rent is zero if the room is unoccupied).

Provide a class diagram to model the hotel problem.