

Exercises on basic UML: structures

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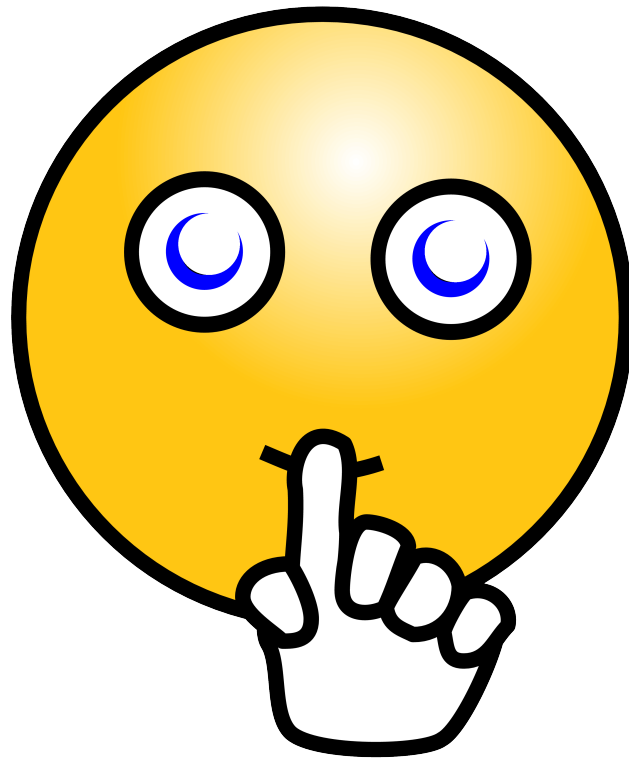
Summary

- This is a set of exercises on writing and understanding the UML notations
- Some exercises have more than one correct answer
- Most of them are taken from the net

Diagrams covered

- Class diagrams
- Object diagrams
- Domain diagrams
- Context diagrams
- Feature diagrams

Think about it!



Reading exercises

- Read the UML class diagram
- Pay attention to the multiplicity
- Try to understand the relationship and describe it in natural language

Veterinary System

- Try to read & understand this UML diagram



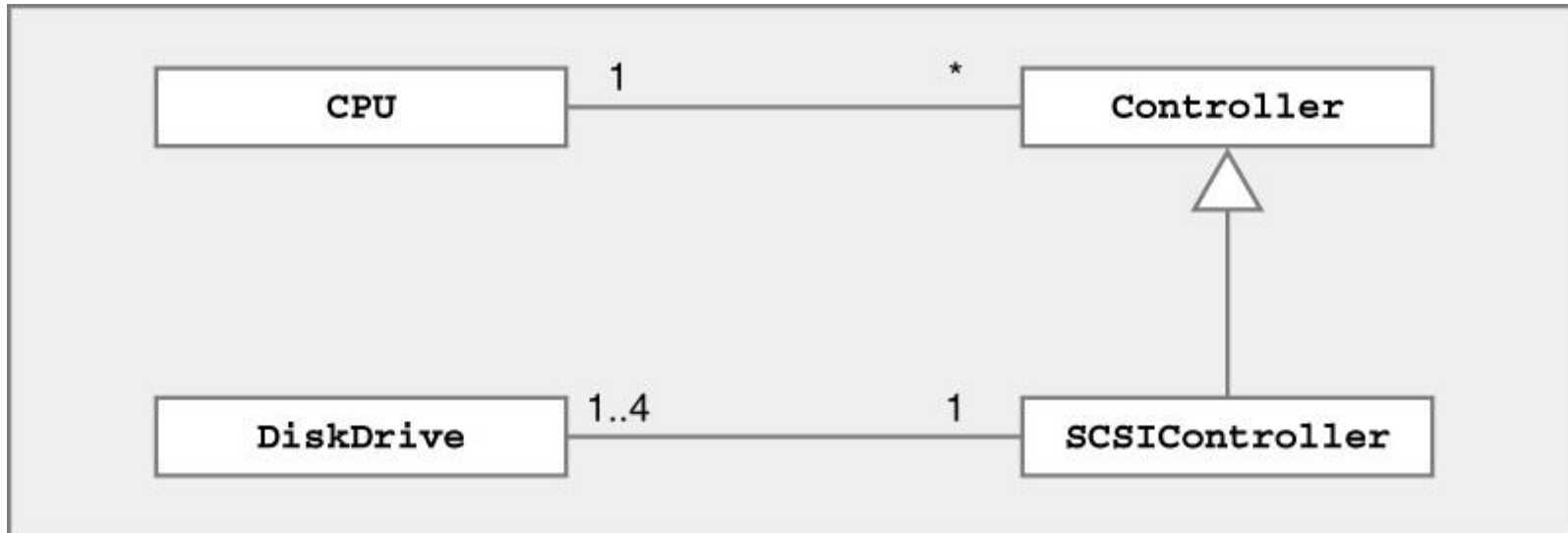
Veterinary System

- Read and understand this UML diagram

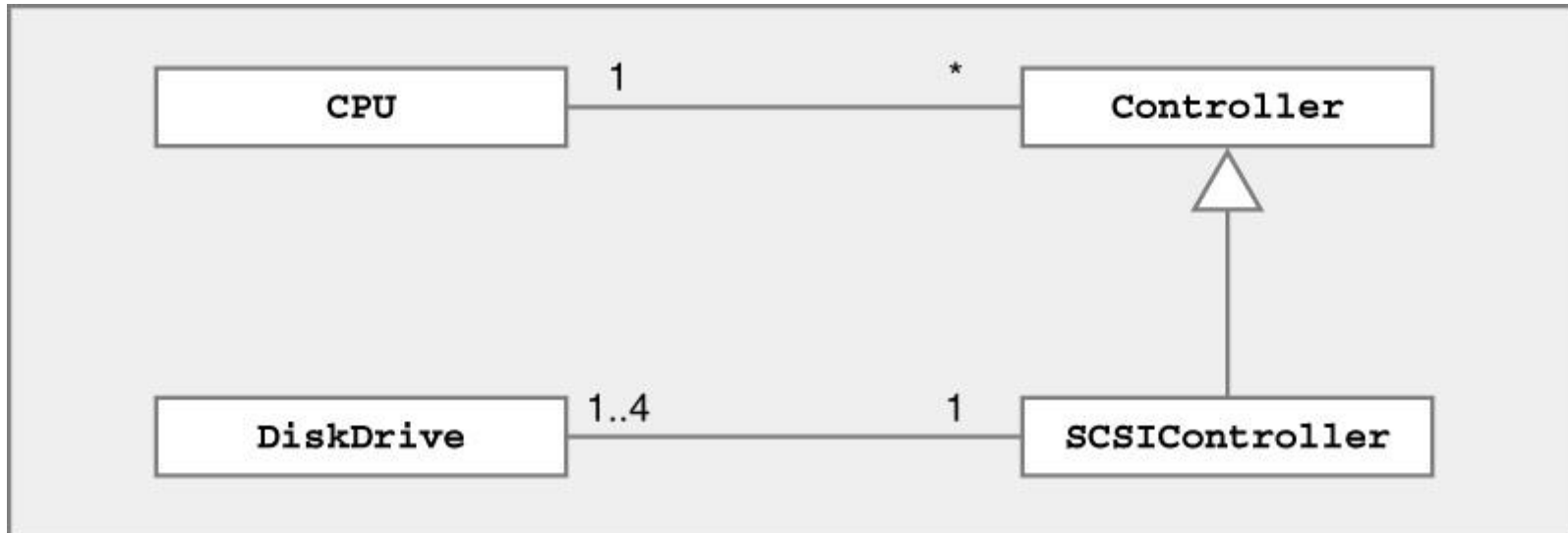


- 1 or more Pets associated with 1 PetOwner
- Each pet has exactly one PetOwner

Computer System

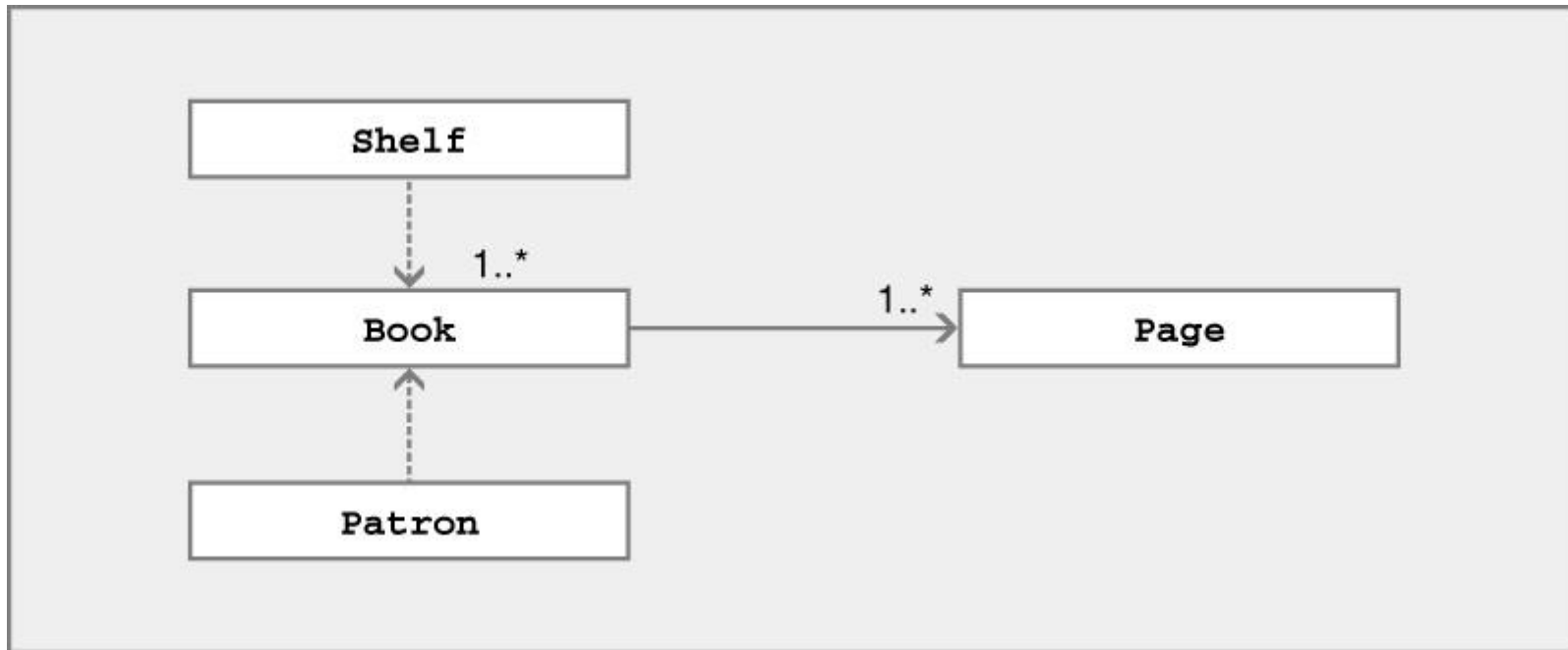


Computer System

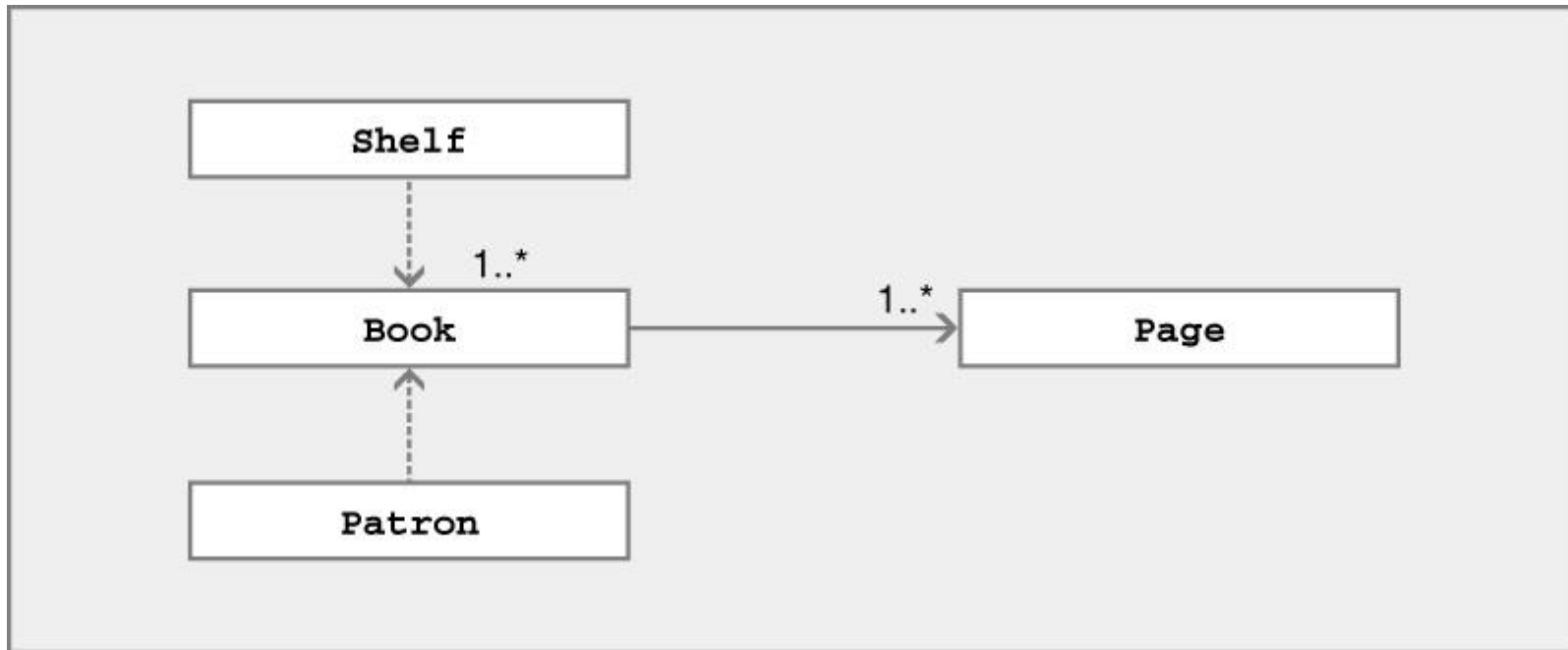


- 1 CPU associated with 0 or more Controllers
- 1-4 DiskDrives associated with 1 SCSIController
- SCSIController is a (specialized) Controller

Library System

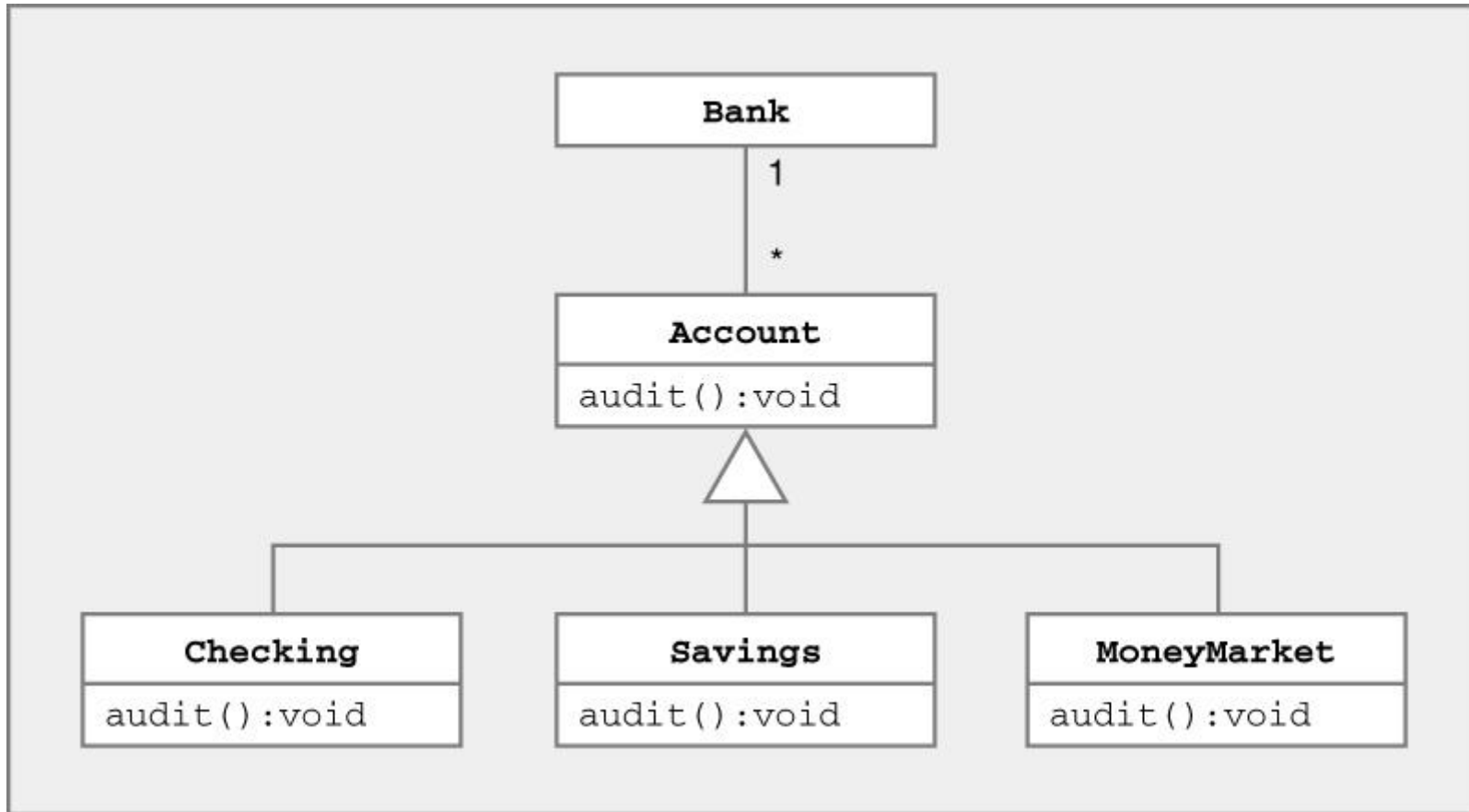


Library System

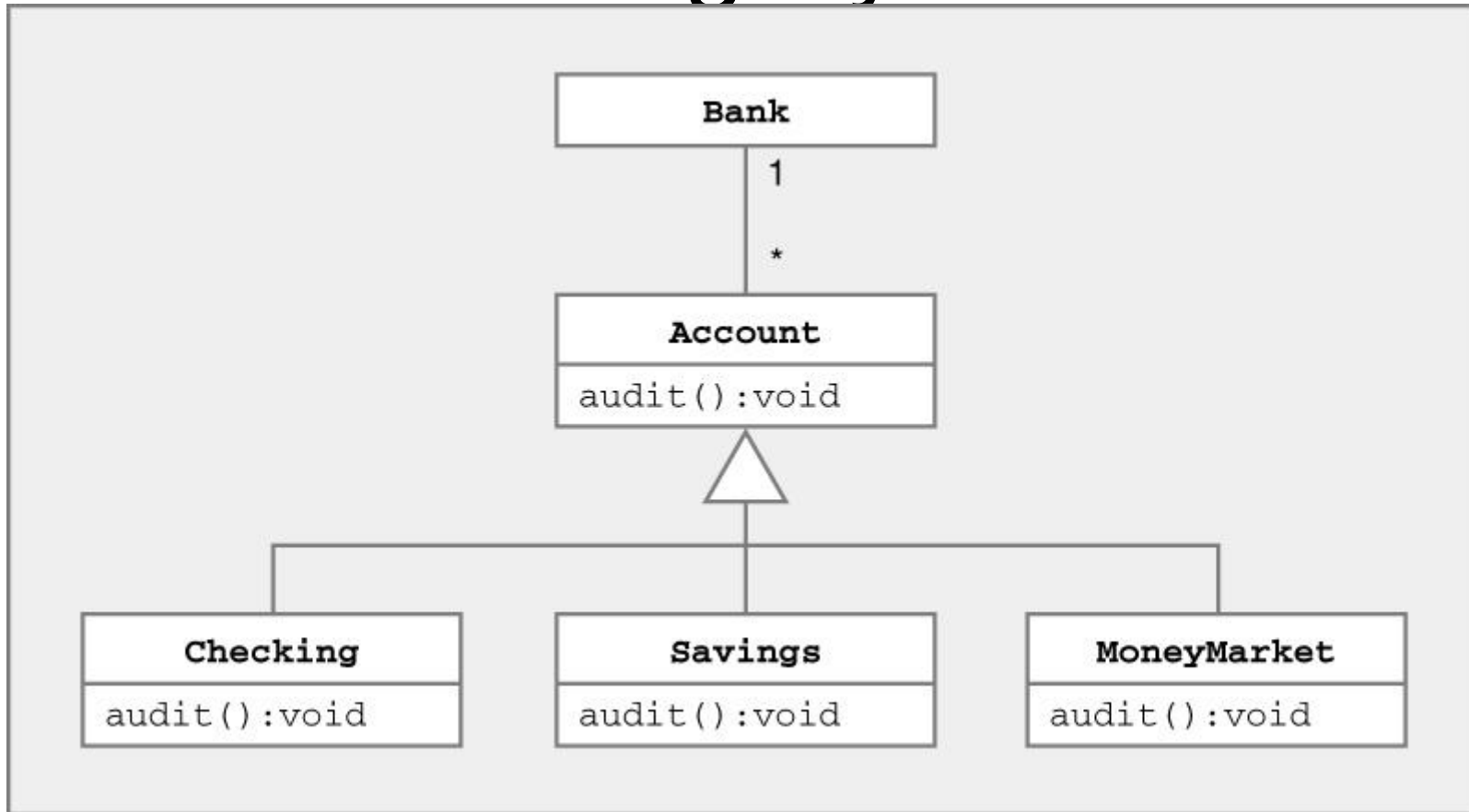


- 1 or more Book associated with 1 or more Pages
- Patron & Shelf use (depend on) Books

Banking System

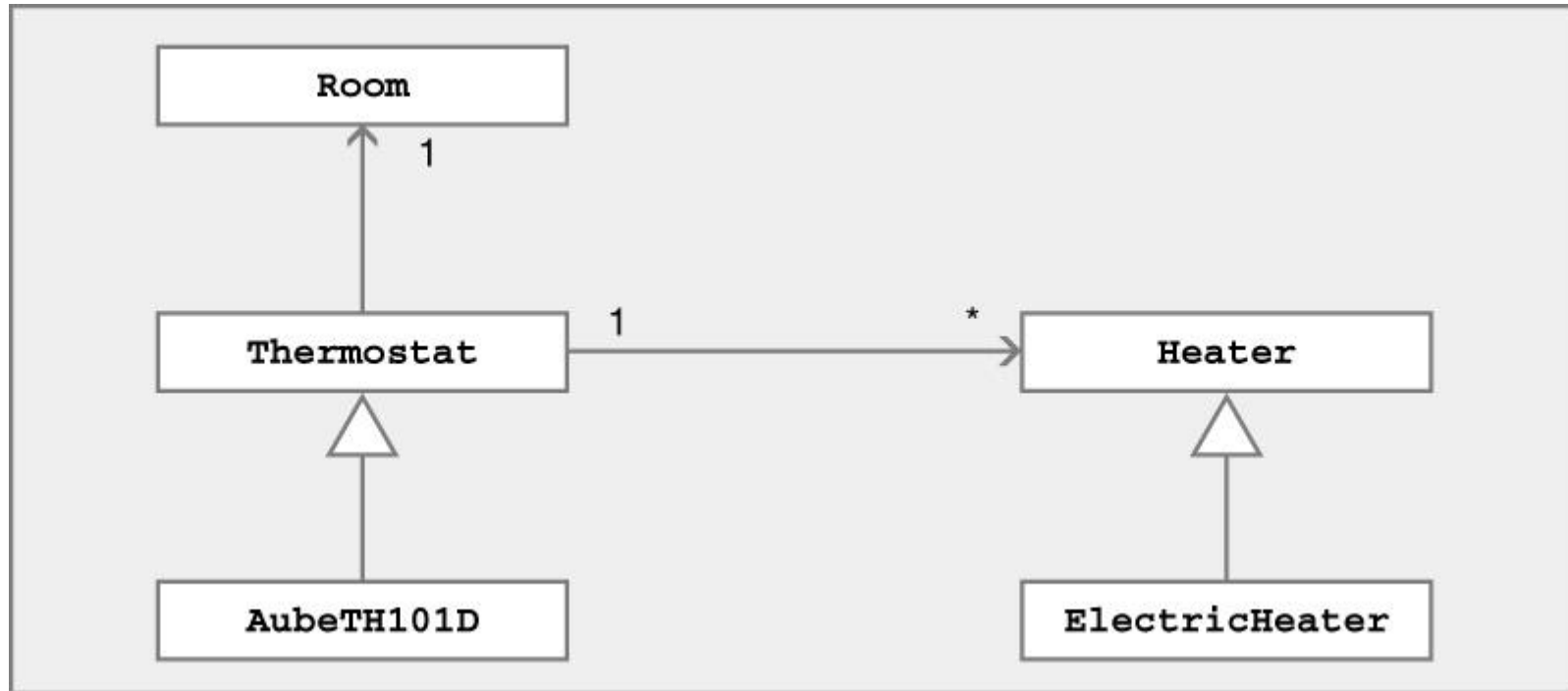


Banking System

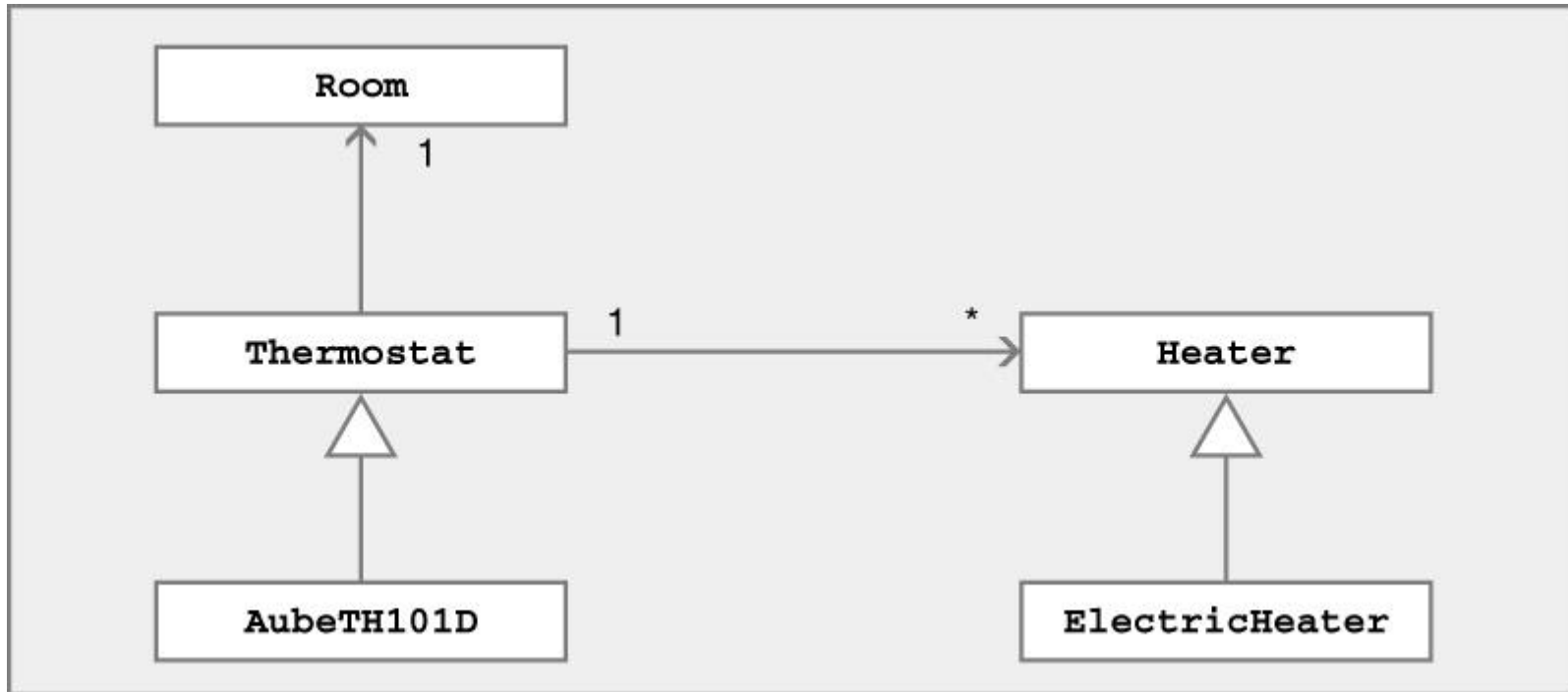


- 1 Bank associated with 0 or more Accounts
- Each Account is associated with exactly one bank
- Checking, Savings, and MoneyMarket are Accounts

Home Heating System

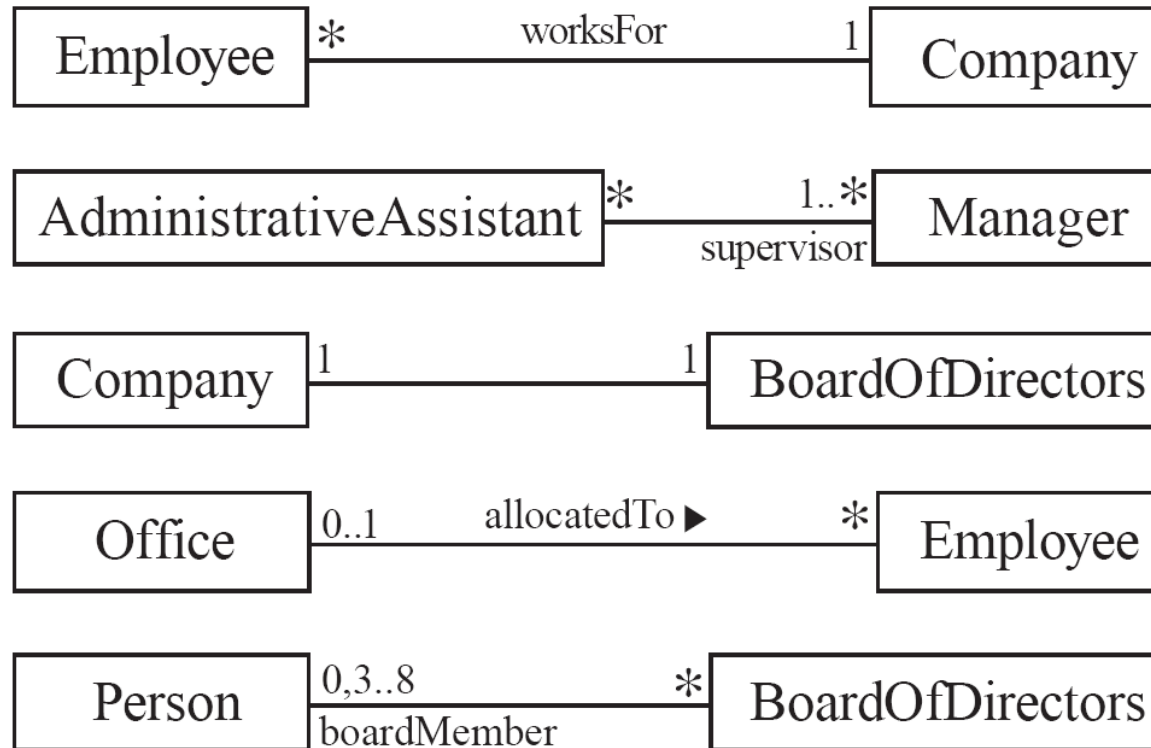


Home Heating System



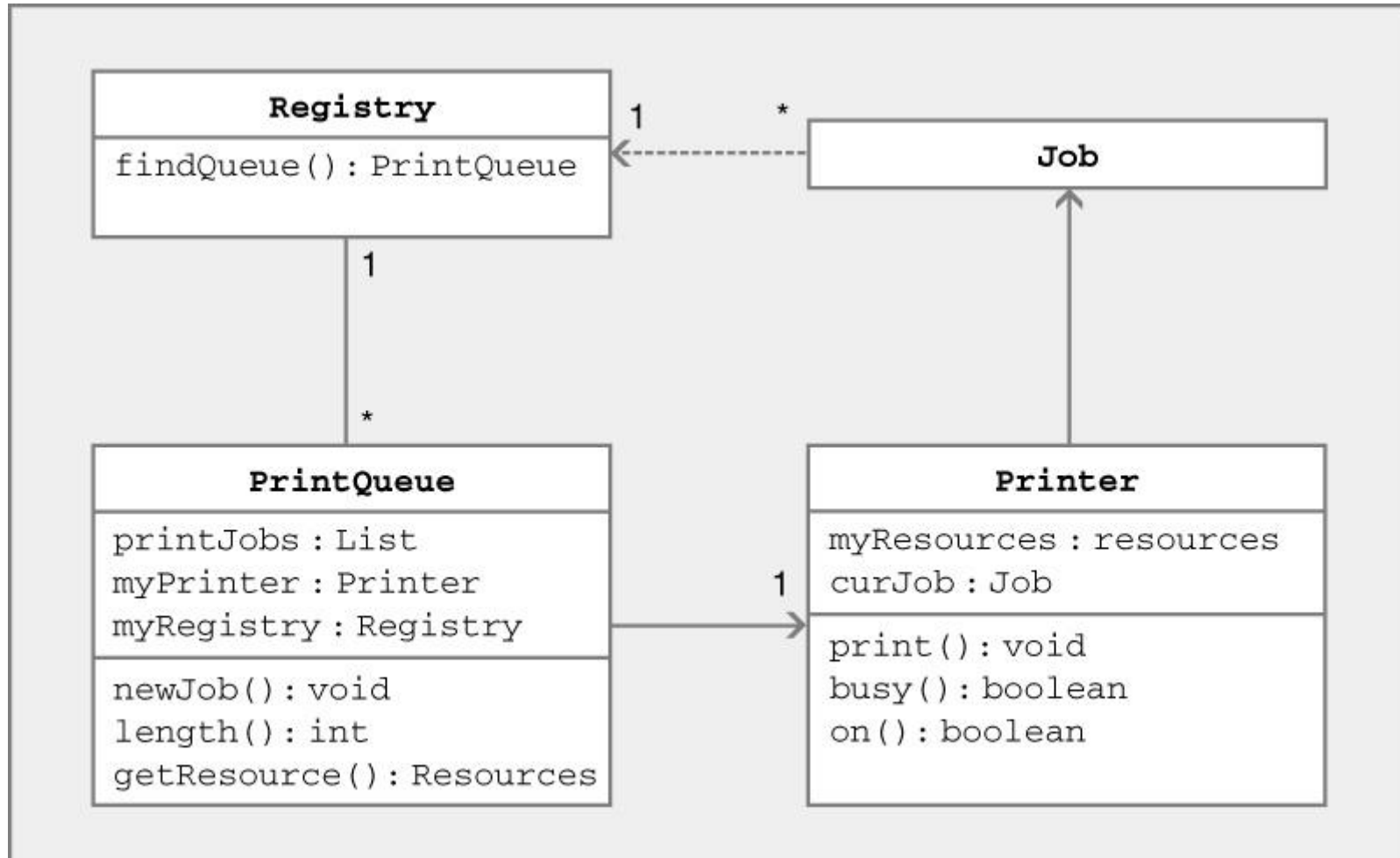
- Room has 1 Thermostat
- Each Thermostat is associated with 0 or more Heaters
- A Heater has exactly one Thermostat
- ElectricHeater is a specialized Heater
- AubeTH101D is a specialized Thermostat

Company

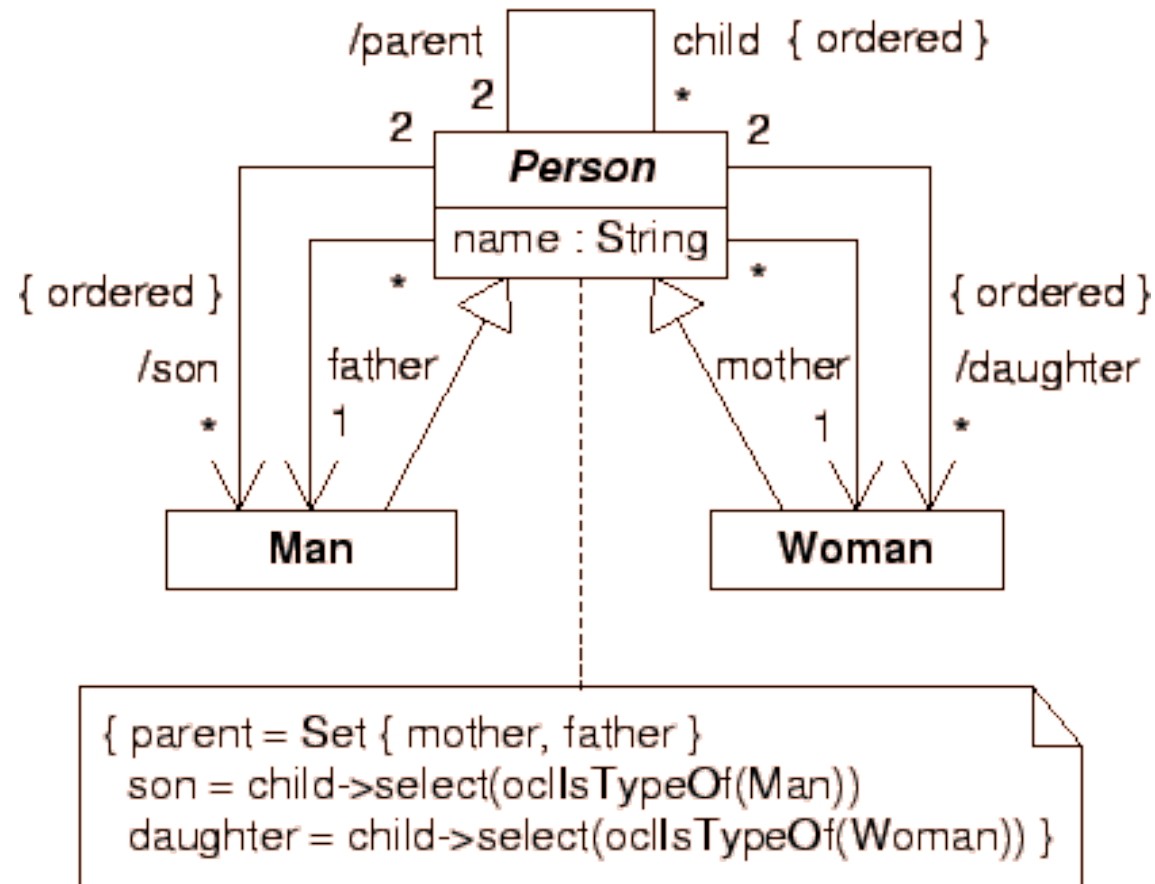


- Each employee works for one company (which can have 0 employees)
- Each AdministrativeAssistant has one or more supervisors (who can have 0 or more employees)
- Each Company has exactly one BoardOfDirectors (and viceversa)
- Each Office is allocated to zero or more Employees (an Employee can have no office or at most one)
- A Person is boardMember of 0 or more BoardOfDirectors (each BoardOfDirectors has from 3 to 8 Persons)

Printing System



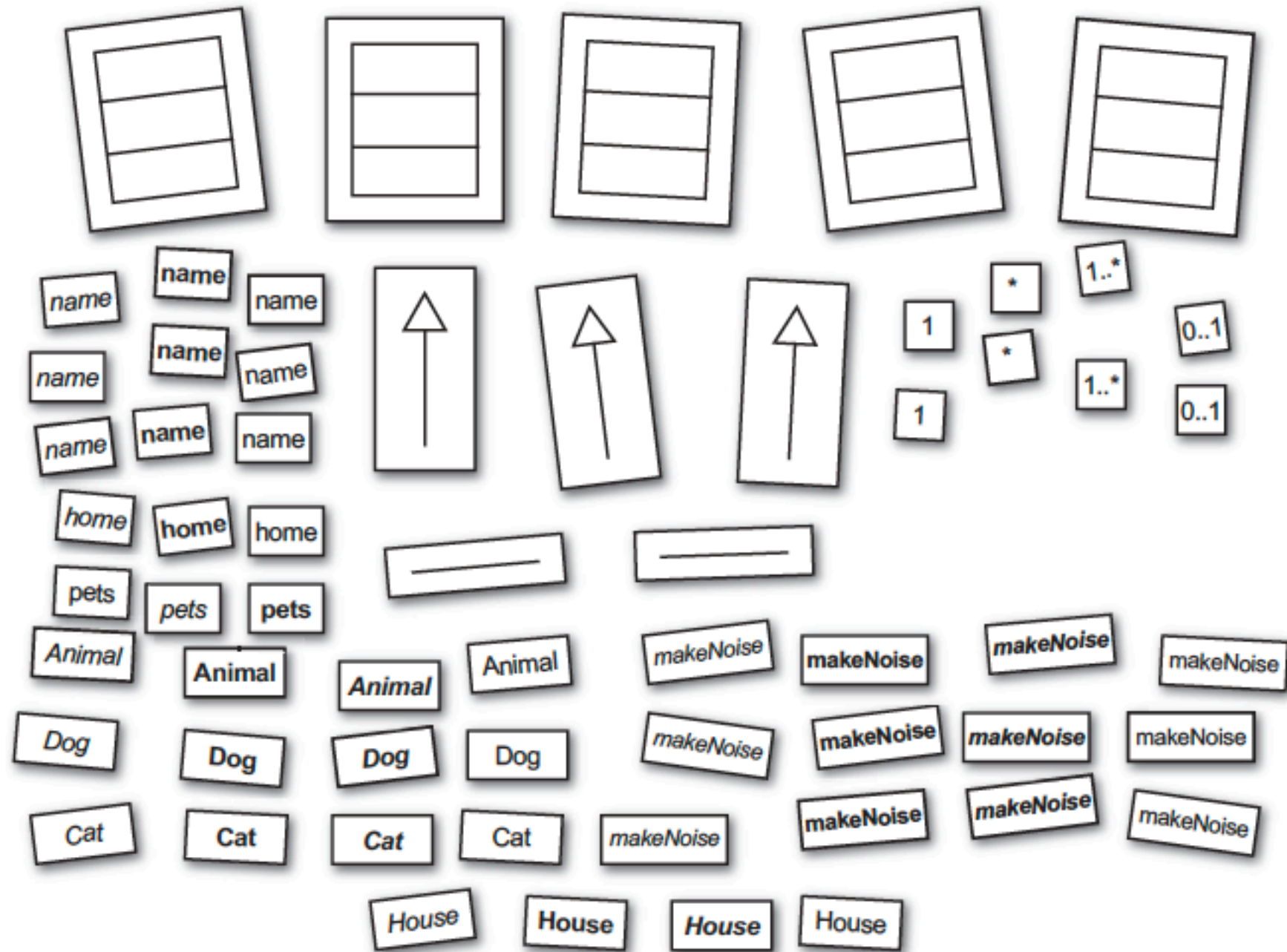
Family



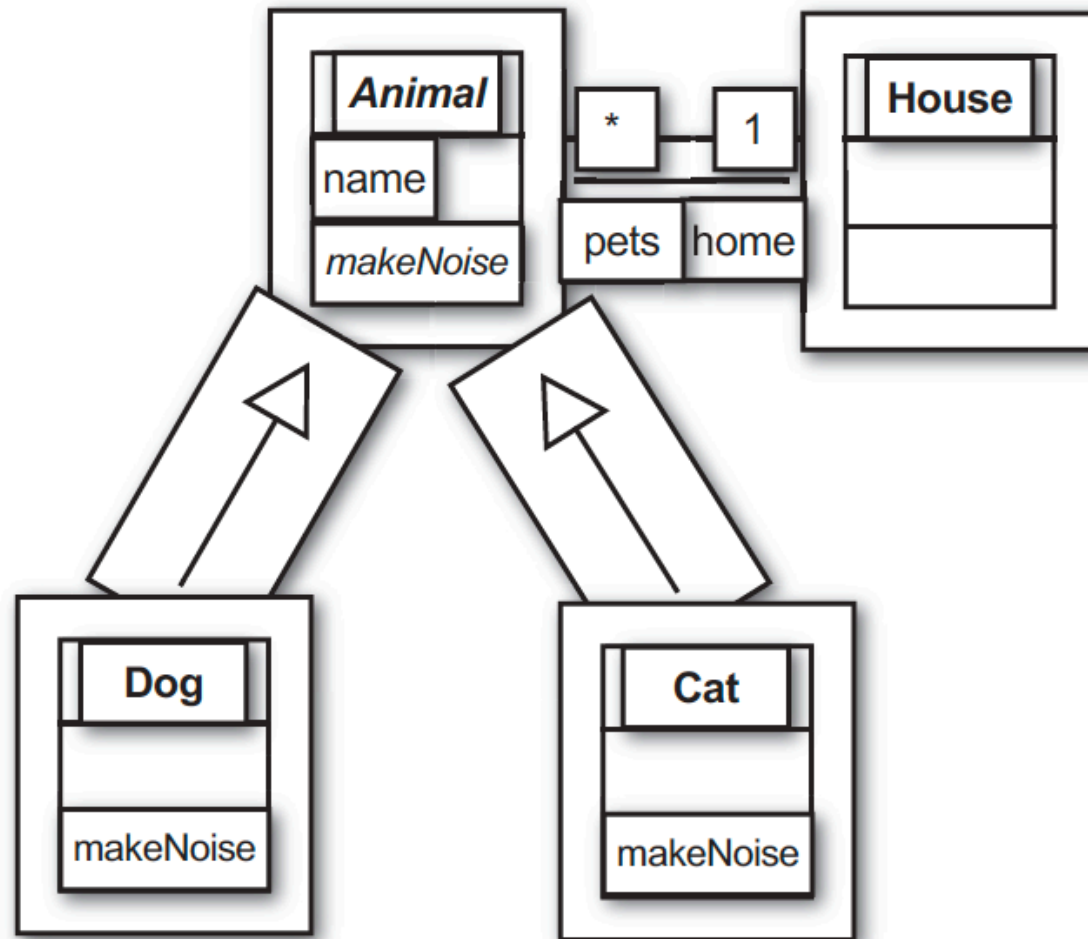
A woman can have as sons two twins?

On class diagrams

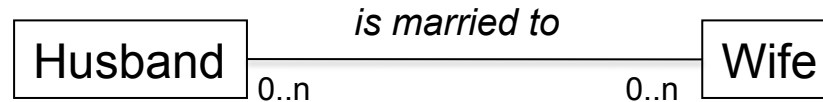
- A house may have any number of pets living in it
- The two possible types of pets that can live in a house are dogs and cats
- Each dog or cat has a name
- An animal's house is its one and only home
- You can tell an animal to make noise and it will do its thing



Solution



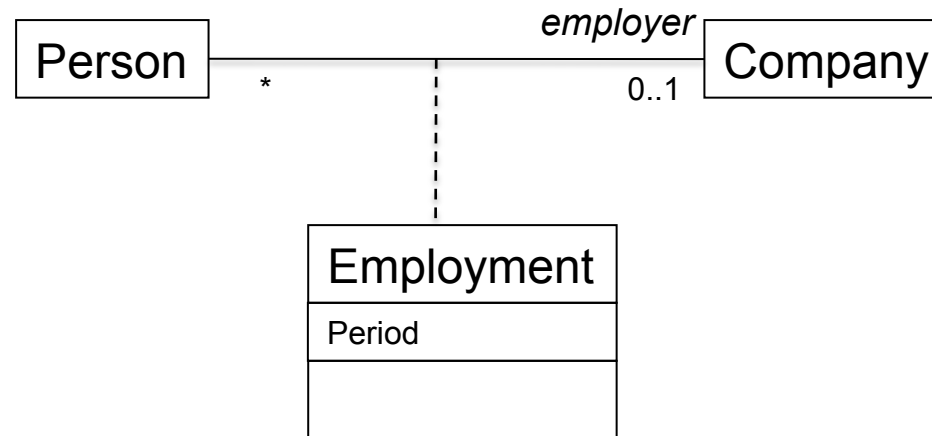
On class diagrams



Given that having multiple spouses at the same time is prohibited, but it is allowed to have many spouses over time ...

- a) The diagram represents the concepts to be modeled and no changes are required
- b) Use the <<history>> stereotype to show the history over time and snapshot in time constraint in the model.
- c) Promote the “is married to” association to an association class called Marriage and break up the Many-to-Many association between Husband and Wife
- d) Create a link attribute called “wedding date” and attach it to the association, rather than to either Class in the Association
- e) Create a link attribute called “wedding date” and attach it to either husband or wife class

On class diagrams



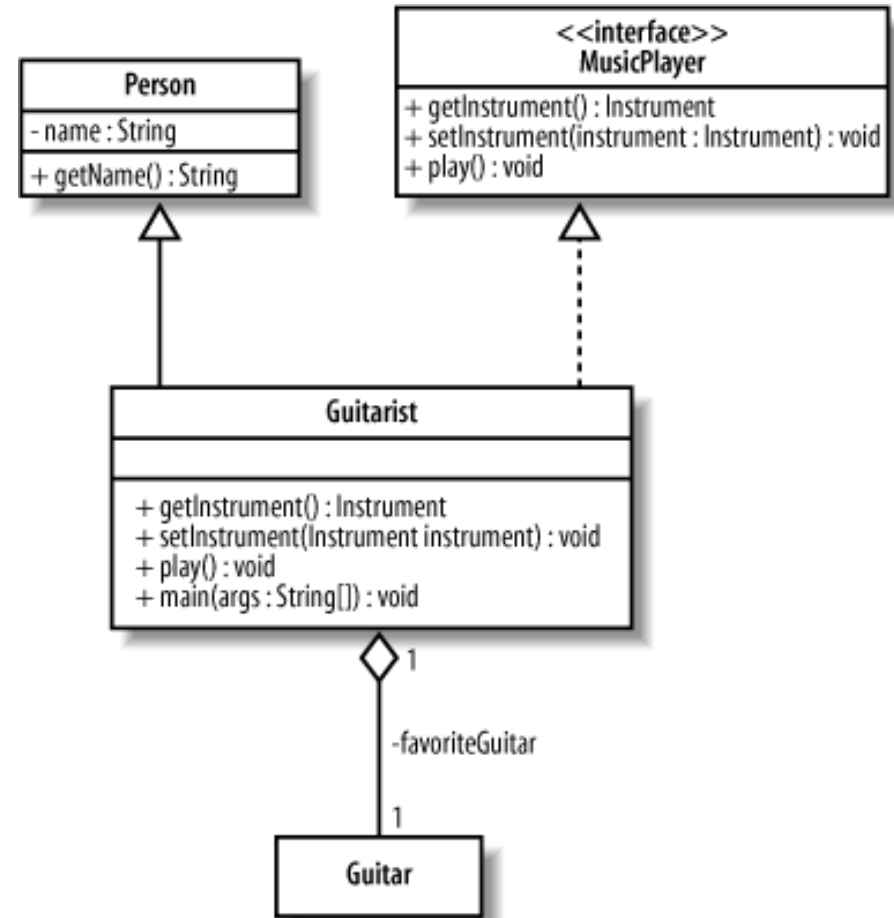
Which sentences are coherent with this model?

- a) A company may employ 0 or 1 person
- b) A person may work for a single company
- c) A person has one employment
- d) A company has one employer that is a person
- e) A company may have zero employers

On class diagrams

This diagram says that objects:

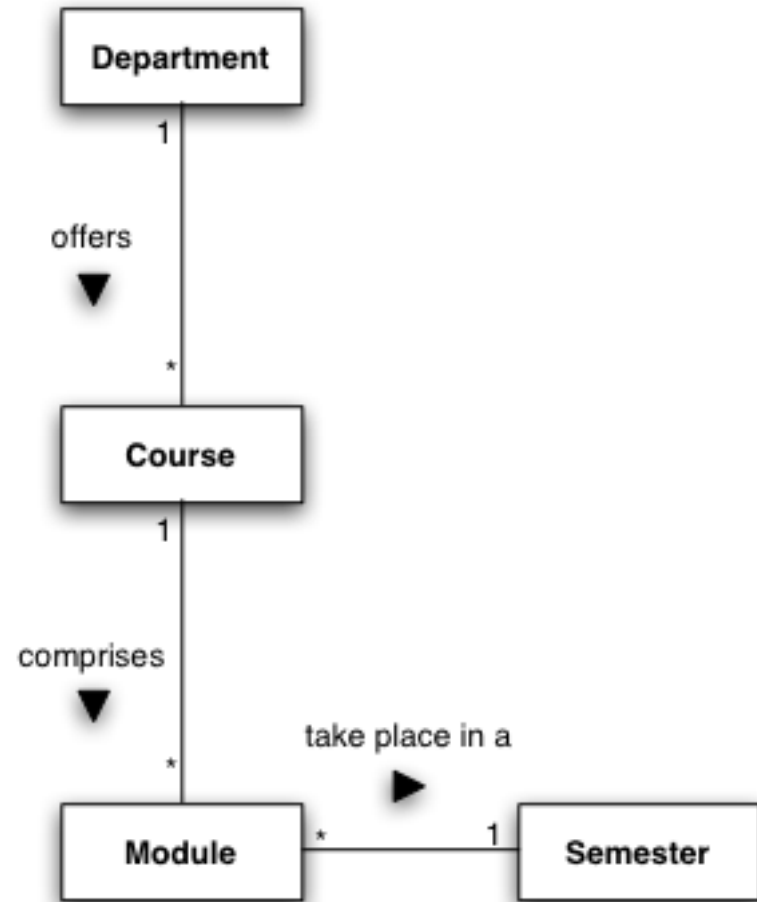
- a) Persons have a name
- b) Guitarists have a name
- c) Guitars have a name
- d) MusicPlayers have a name



On class diagrams

This diagram describes

- a) a sequence
- b) a domain
- c) a system
- d) a use case
- e) a temporal behavior



On class diagrams

Which of the following aspects is not part of a design class diagram?

- a) Attributes with their types
- b) Operations with arguments and results
- c) Composition relationship
- d) Events and actions
- e) Visibility information
- f) Navigation information

On class diagrams

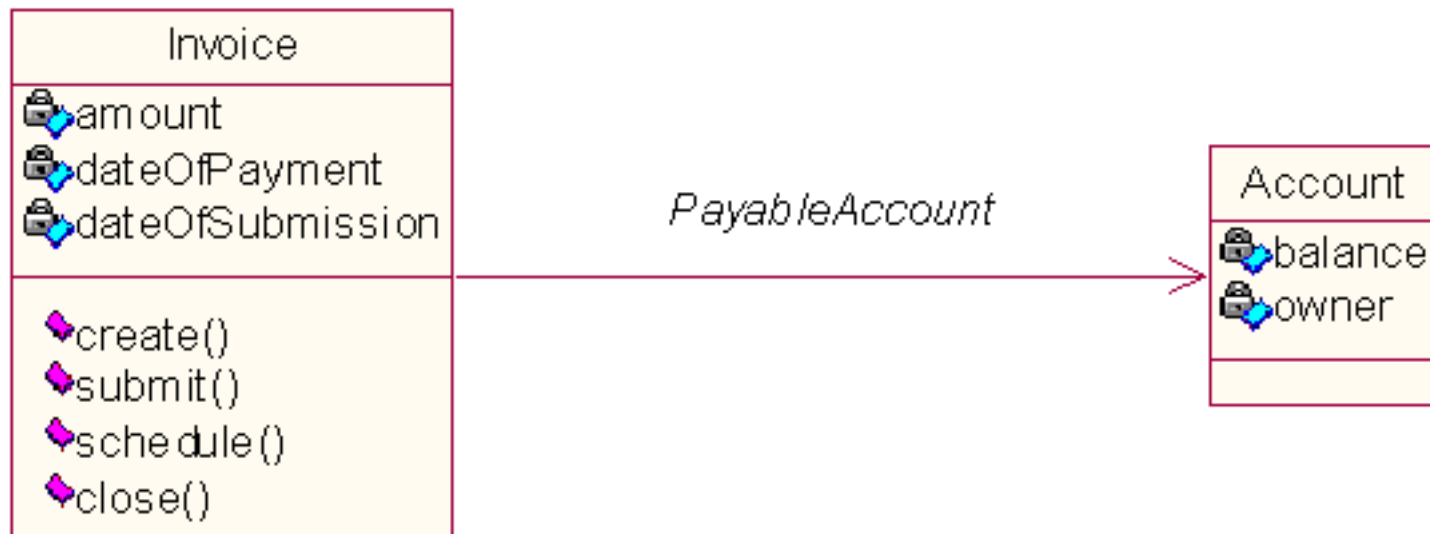
Classify the following into *generalization* (G), *association* (A), *aggregation* (AG), or *composition* (C):

- a) A country has a capital city
- b) A dining philosopher uses a fork
- c) A file is an ordinary file or a directory file
- d) Files contain records
- e) A class can have several attributes
- f) A relation can be association or generalization
- g) A polygon is composed of an ordered set of points
- h) A person uses a computer language on a project

On class diagrams

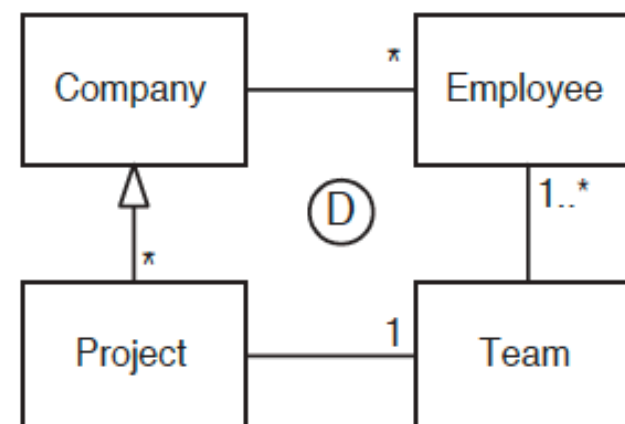
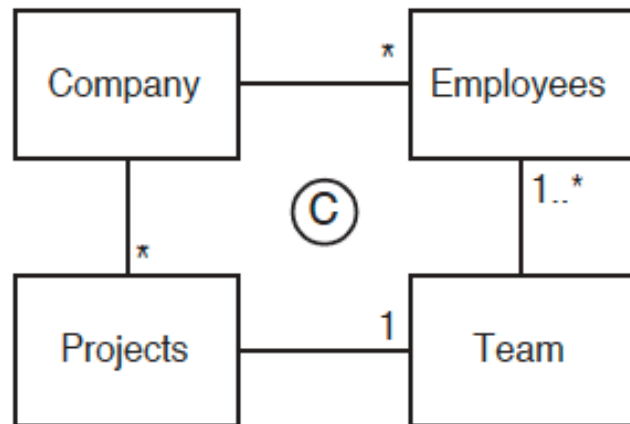
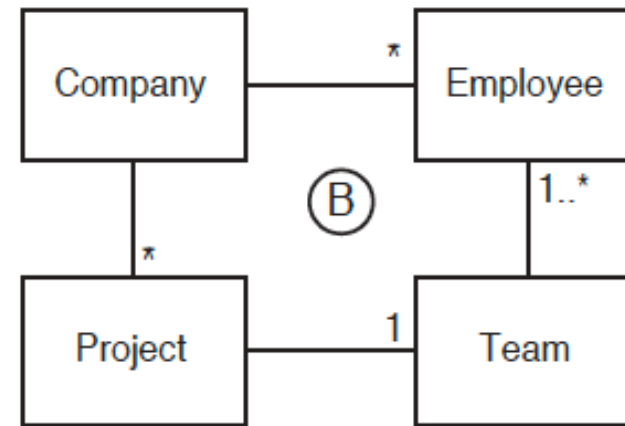
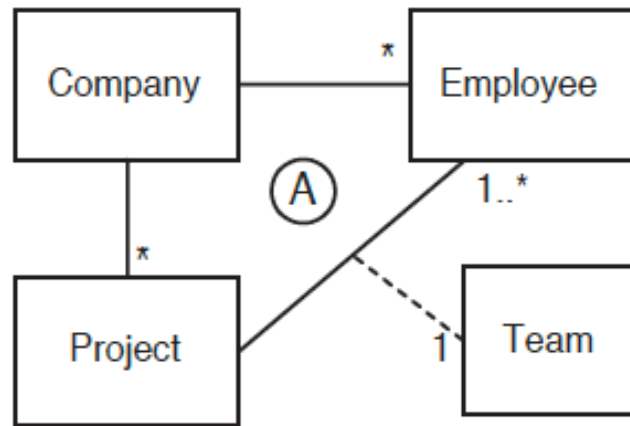
The arrow between the two classes indicates:

- a) Inheritance
- b) Association
- c) Dependency
- d) Sending a message



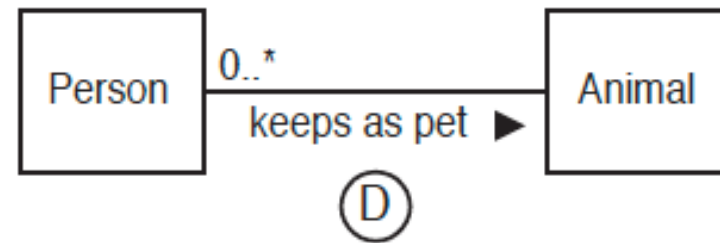
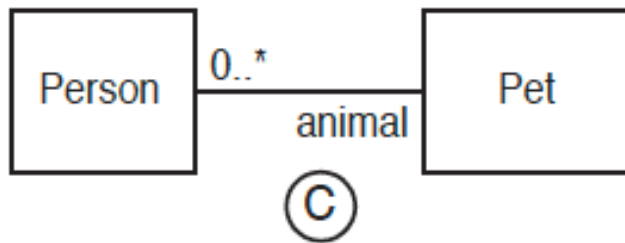
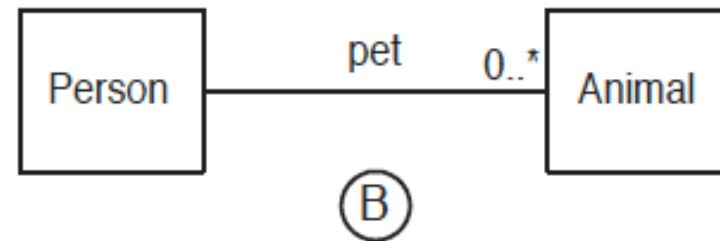
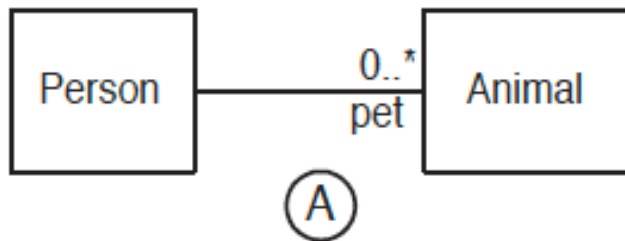
On class diagrams

Consider the following situation:
a company realizes projects; each project is executed by a team of employees.
Which would be a suitable conceptual UML diagram?



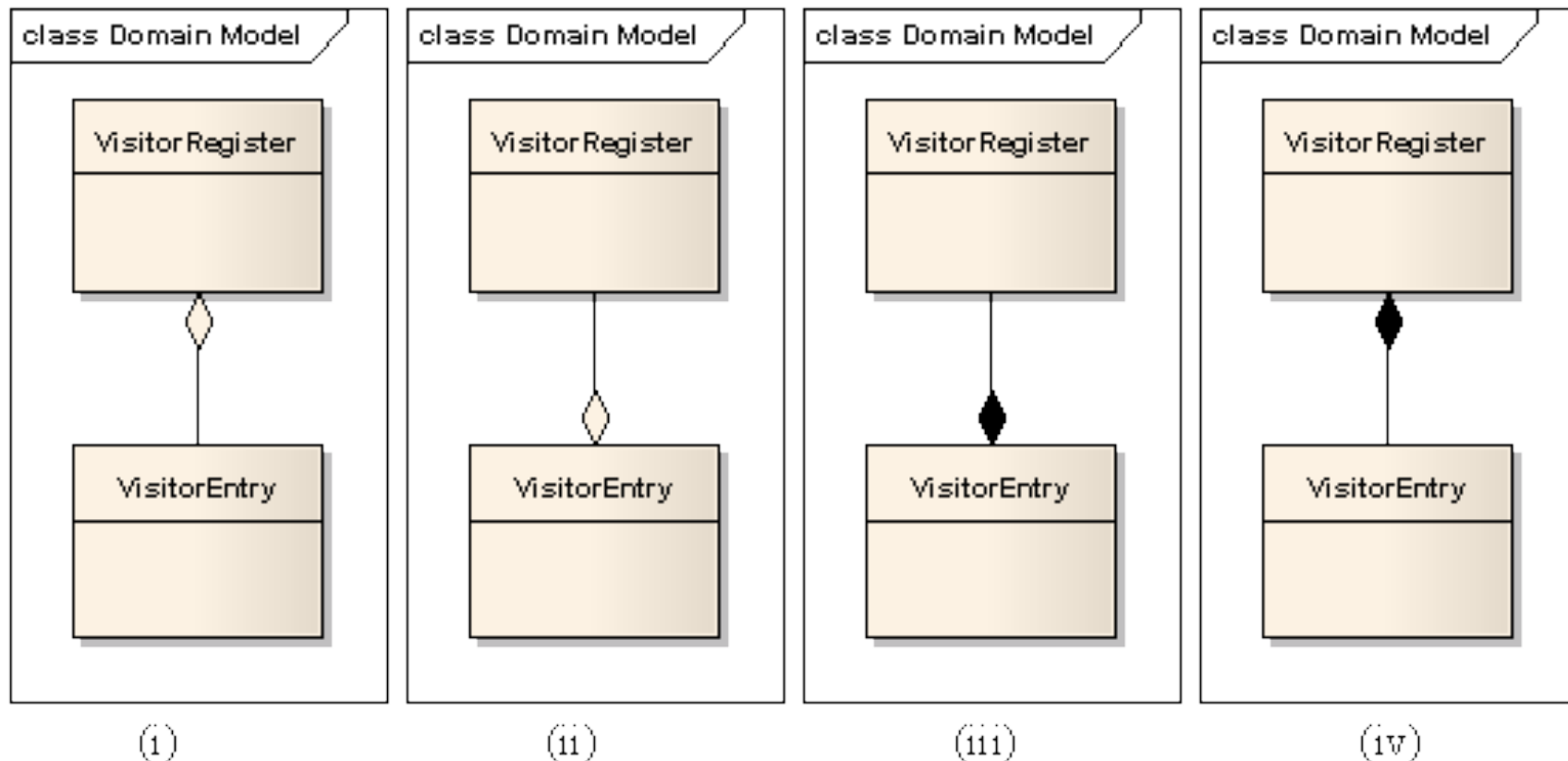
On class diagrams

How do you express that some persons keep animals as pets?



On class diagrams

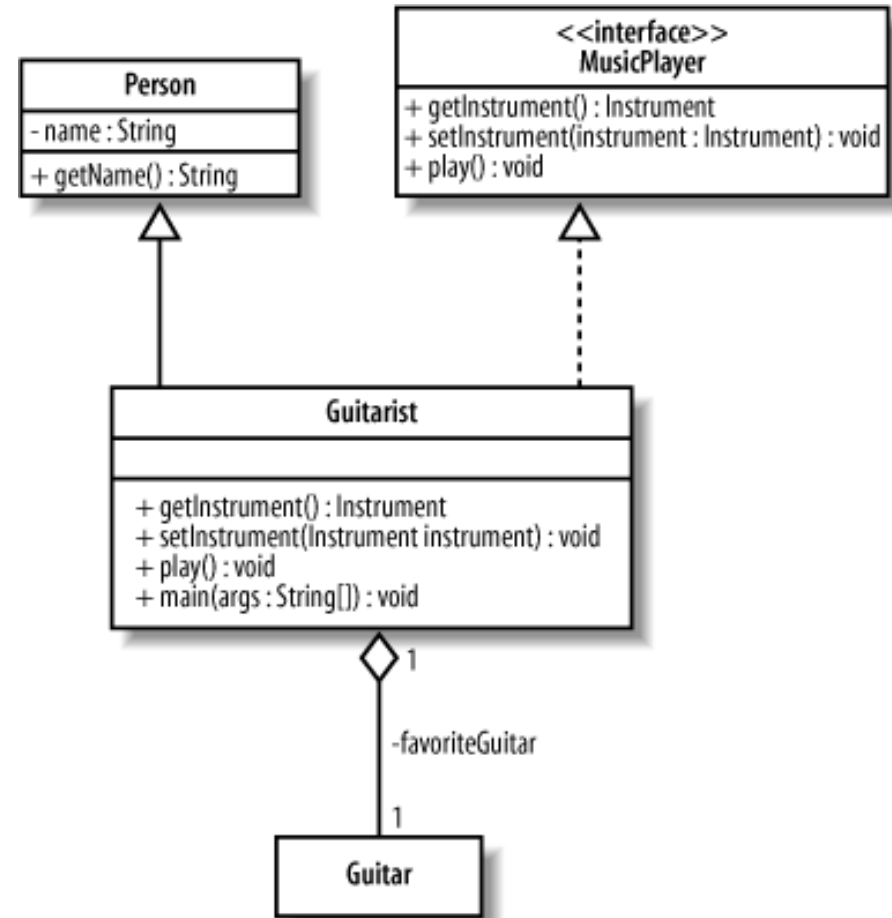
A visitor register is made of visitor entries



On class diagrams

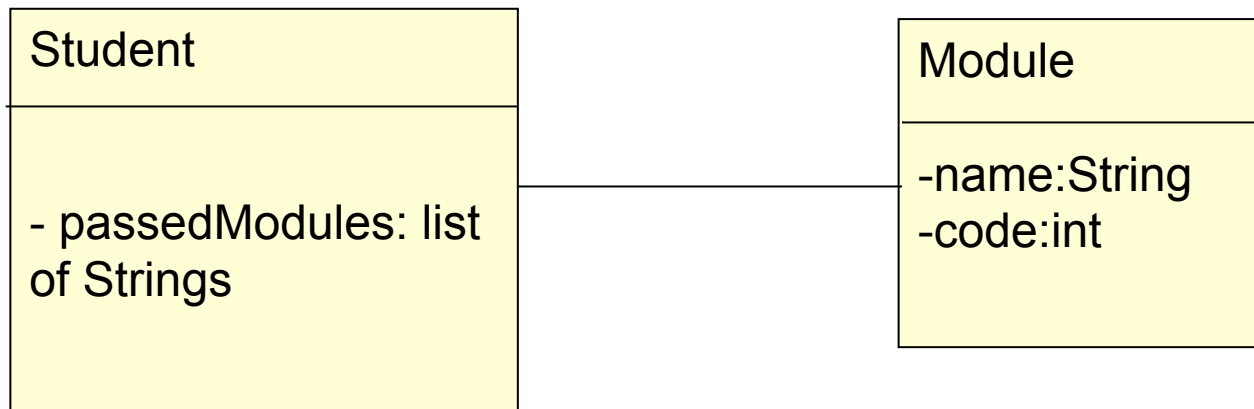
This diagram says that objects having a “main” method are

- a) Persons
- b) Guitarists
- c) Guitars
- d) MusicPlayers, when implemented by Guitarists



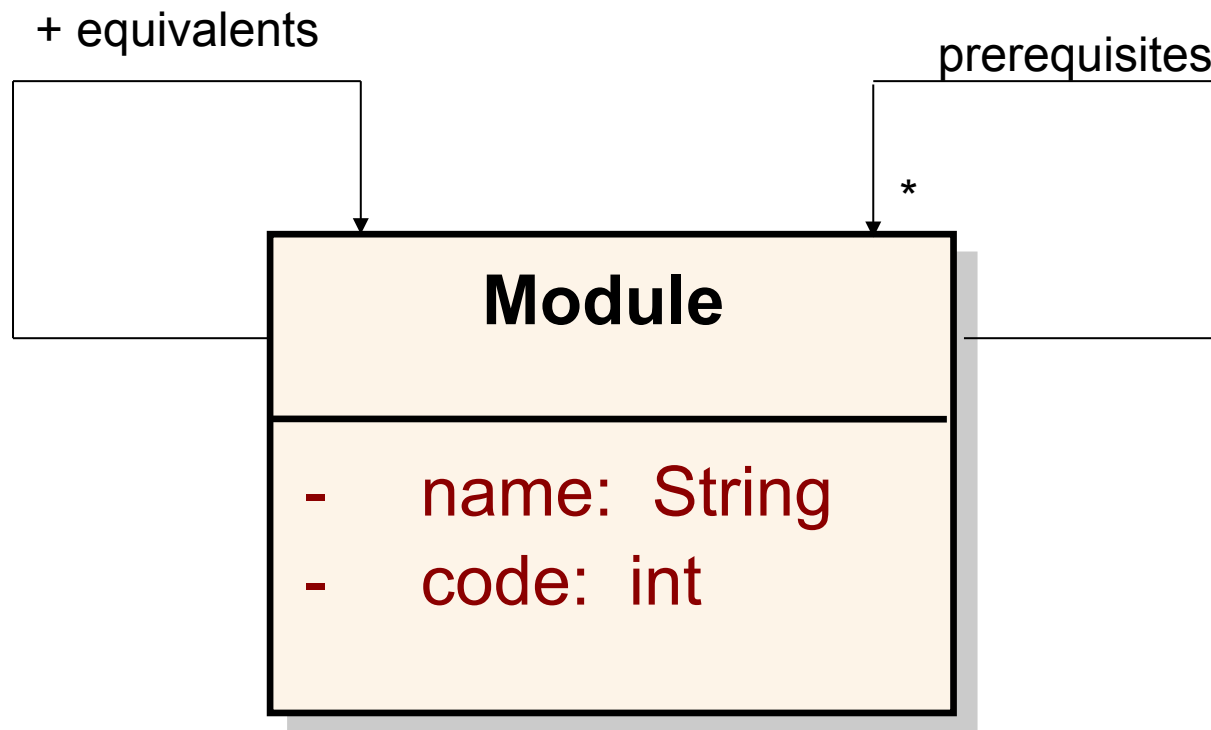
On class diagrams:

- Right or wrong?



On class diagrams

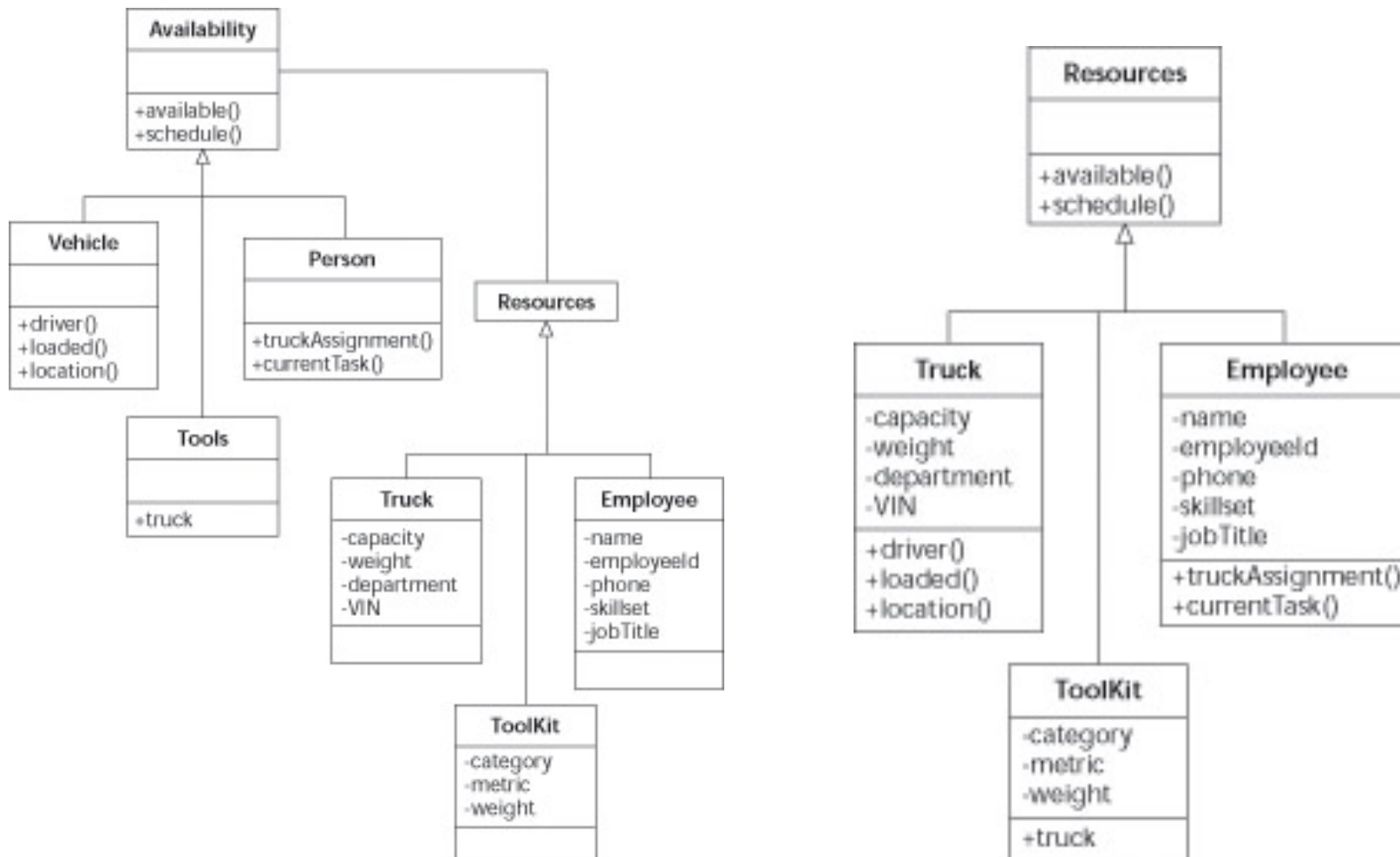
- Right or wrong?



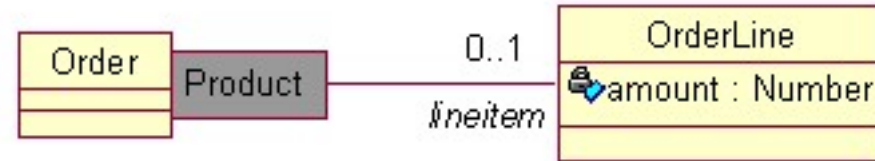
On class diagrams

Examine these two diagrams; true or false?

- a) The right diagram has more information
- b) The left diagram has more information
- c) They are equivalent, but the right one is simpler
- d) They are equivalent, but the left one is simpler



On class diagrams



This association could be translated in an interface like:

- a) `class Order { public OrderLine getLineItems() ;
public void addLineItem(Number amount);`
- b) `class Order { public OrderLine getLineItems() ;
public void addLineItem(OrderLine lineItem);`
- c) `class Order { public OrderLine
getLineItems(Product aProduct) ; public void
addLineItem(Number amount, Product aProduct);`
- d) `class Order { public Object getLineItems() ;
public void addLineItem(OrderLine lineItem);`



On class diagrams

A benefit of using polymorphism is a reduction of:

a) methods in the associated classes

b) subclasses needed to accomplish the same functionality

c) case statements and conditionals

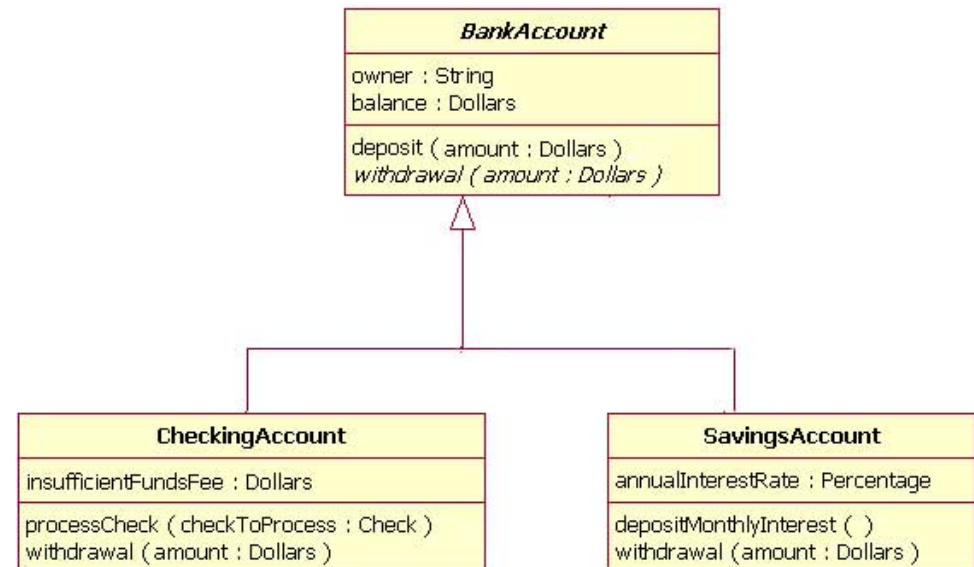
d) coupling between classes in the system



On class diagrams

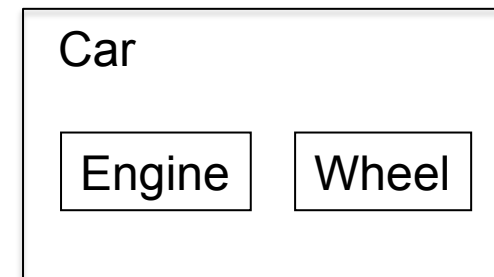
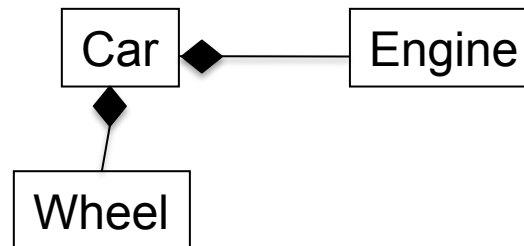
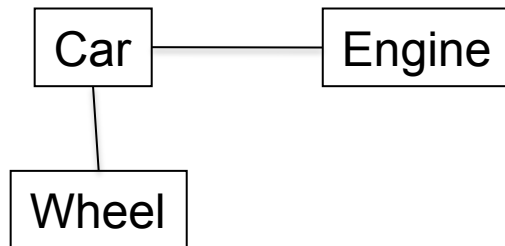
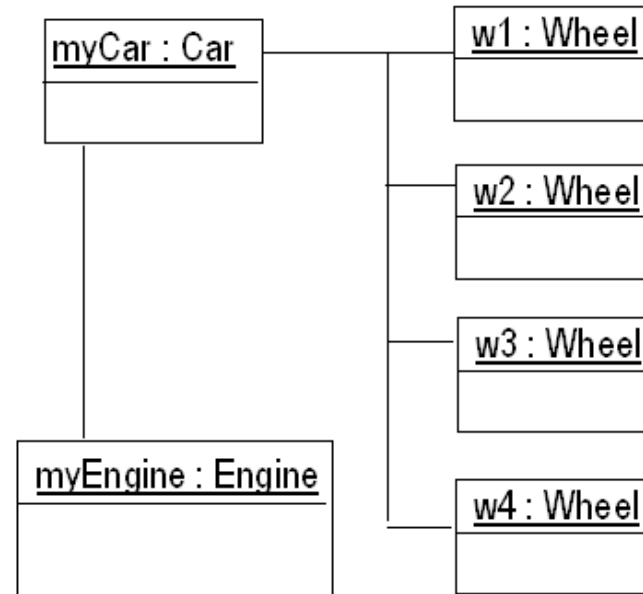
Which sentences are true?

- a) CheckingAccount implements BankAccount
- b) CheckingAccount and SavingAccount are BankAccount
- c) CheckingAccount and SavingAccount are associated
- d) BankAccount is associated to CheckingAccount
- e) SavingAccount can processCheck
- f) CheckingAccount has a balance

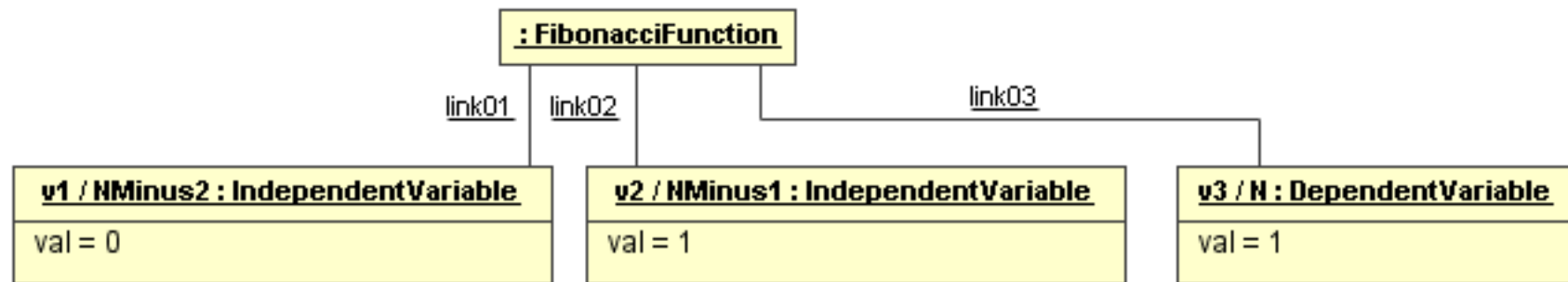


On object diagrams

- This object diagram is instance of which class diagram(s)?



On object diagrams



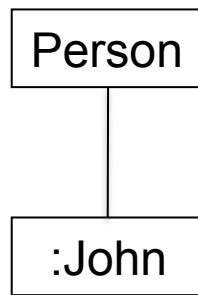
This object diagram

- a) Includes an anonymous object
- b) Includes a class
- c) Includes four instances
- d) Includes three instances

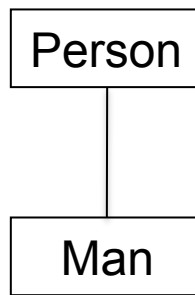


On object diagrams

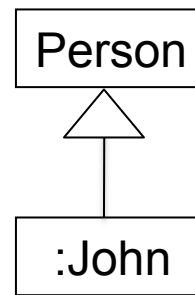
Which diagrams are correct?



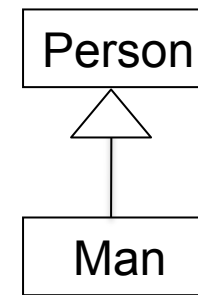
a)



b)

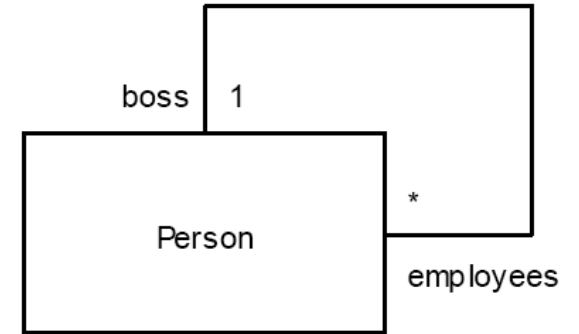


c)

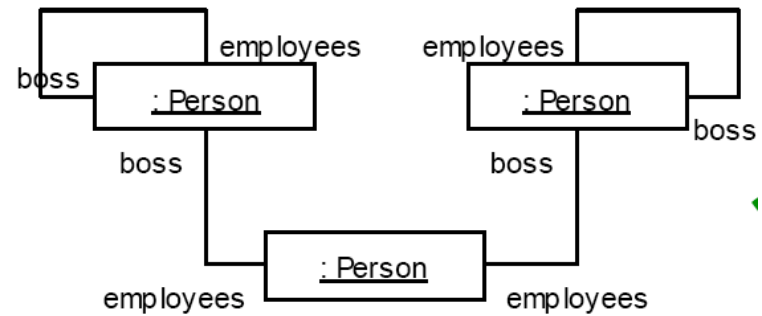
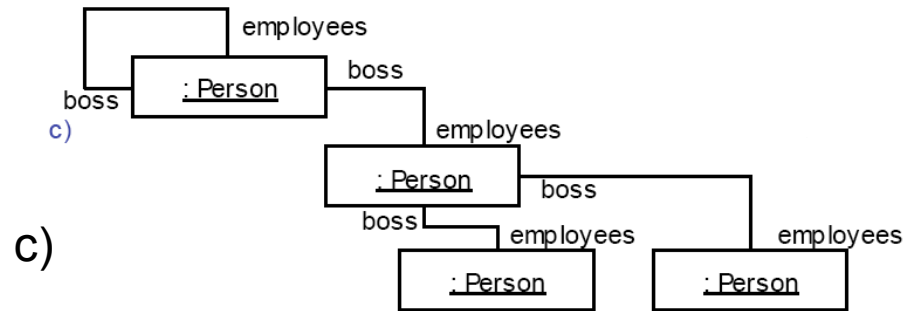
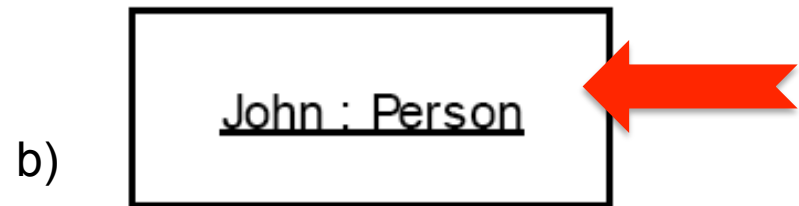
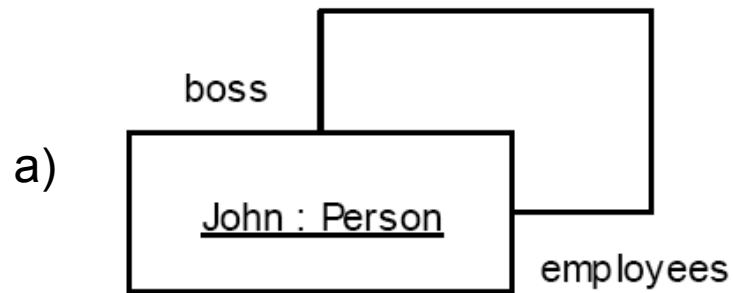


d)

On objects diagrams



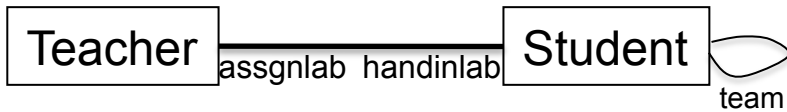
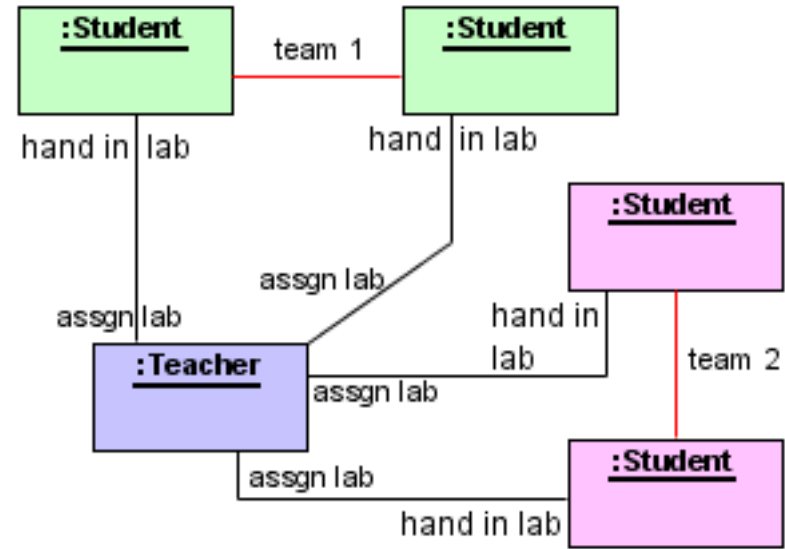
Which one is a non valid instance of this model?



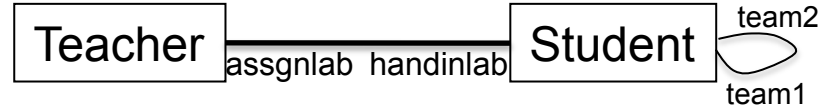
d)

On object diagrams

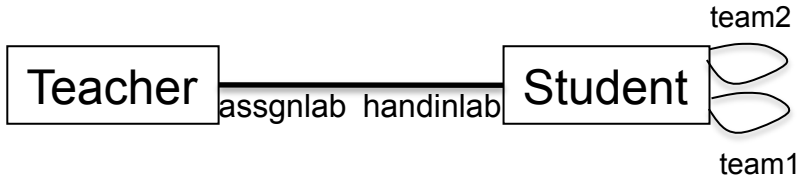
- Which is the class diagram which best corresponds to this object diagram?



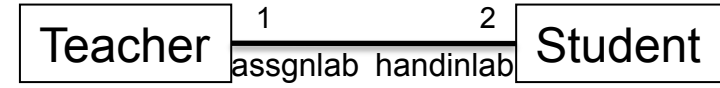
a)



c)



b)



d)

Do-it-yourself exercises

Use case diagram describe how to play chess via an interface able to connect either different engines or a chess server via internet

Class diagram describe the pieces, chessboard and the game tree

Object diagram describe by object snapshots a chess position during a game

Activity diagram describe a game workflow including two players playing via a (telnet) chess server

Statechart describe a game workflow from the viewpoint of the chessboard

Sequence diagram describe a multiagent system evaluating a position

Communication diagram describe a multiagent system evaluating a position

References

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Think about it!

