

# Conceptual Modelling with UML Class Diagram

Erik Perjons

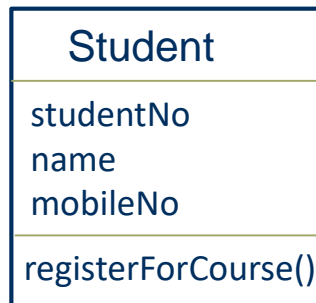
# Questions to answer

- How can you create a conceptual model using UML Class Diagram?

# UML Class Diagram

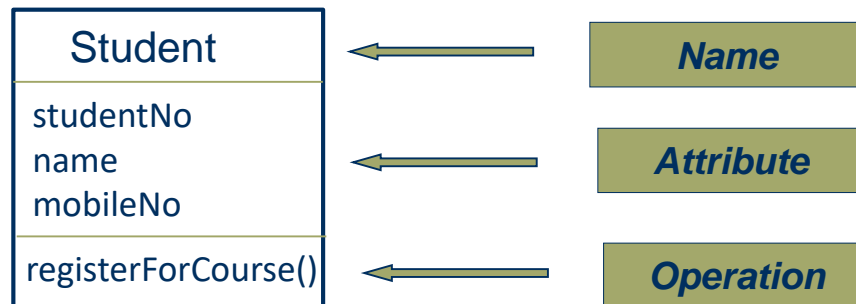
# Class

- A class is shown as a rectangle with three compartments:
  - name of the class (use a noun in singular, first letter capital)
  - attribute(s) (use a noun in singular for each attribute, first letter lower case)
  - operation(s) (use a verb, first letter lower case)



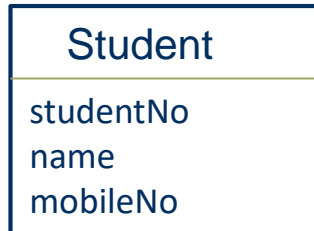
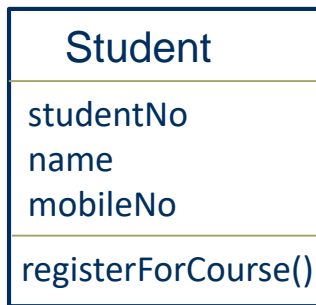
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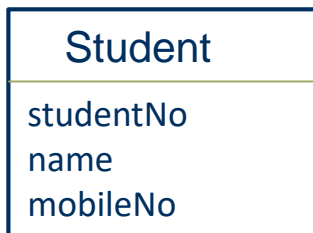
# Class

- The class can be shown in three different variants
- We will use the variant in the middle showing the name of the class and the attributes



# Class

- A class groups a set of things with common properties or characteristics
- An attribute is a descriptive property or characteristic of the class



# Association

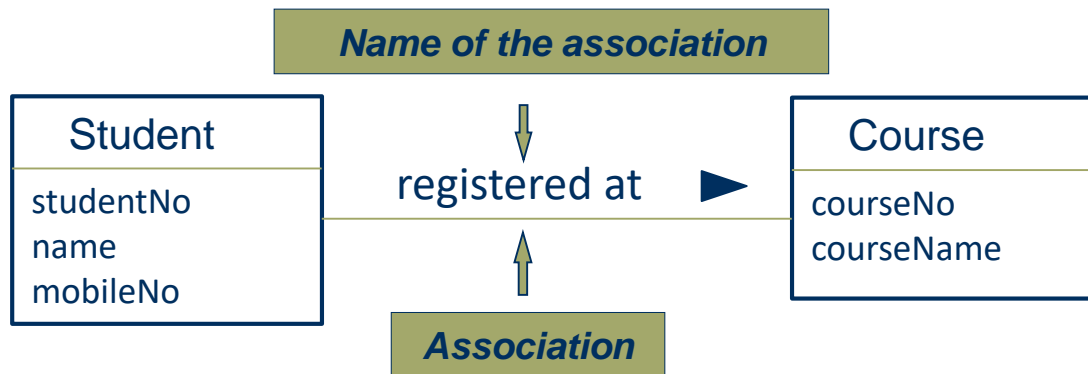
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- In order to support interpretation of the association, it should be given a name – preferably in form of a verb or verb phrase – and it should also be visualized in which direction the name should be read





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# Association

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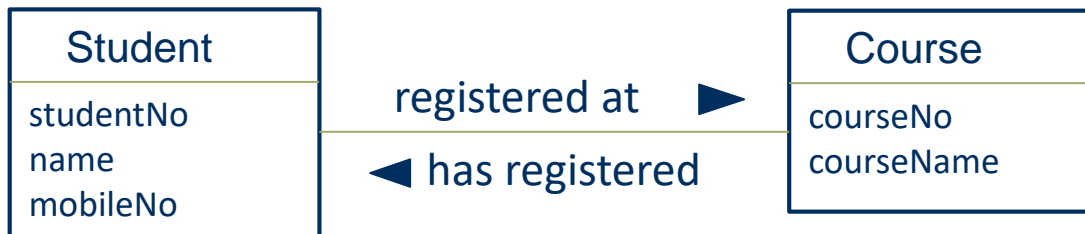
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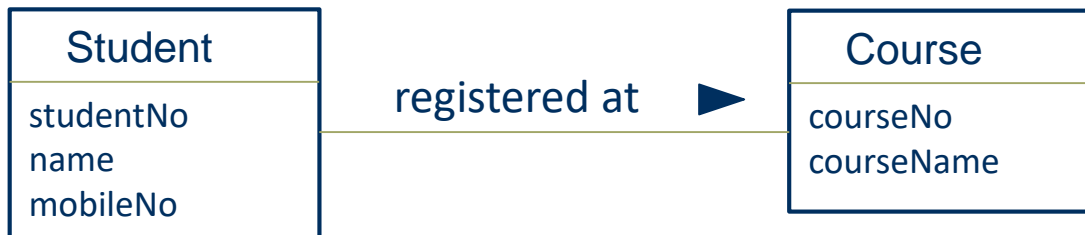
# Association

- Only the name of the association in one direction is usually shown, but there is possible to use names in both direction



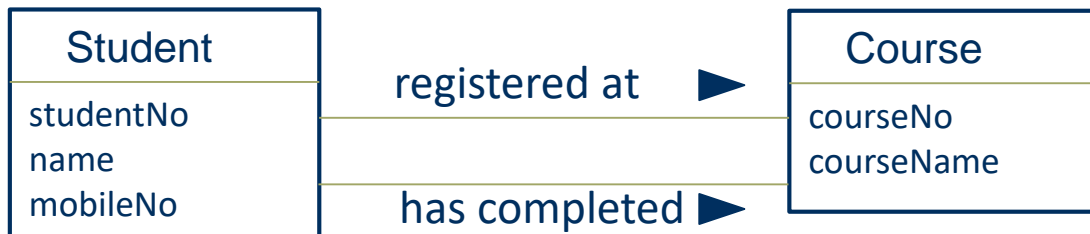
# Association

- Association shows the roles the objects of the classes can play towards each other
- There is a role in each direction of the association:
  - Student plays the role of being registered at course(s)
  - Course plays the role of having registered student(s)



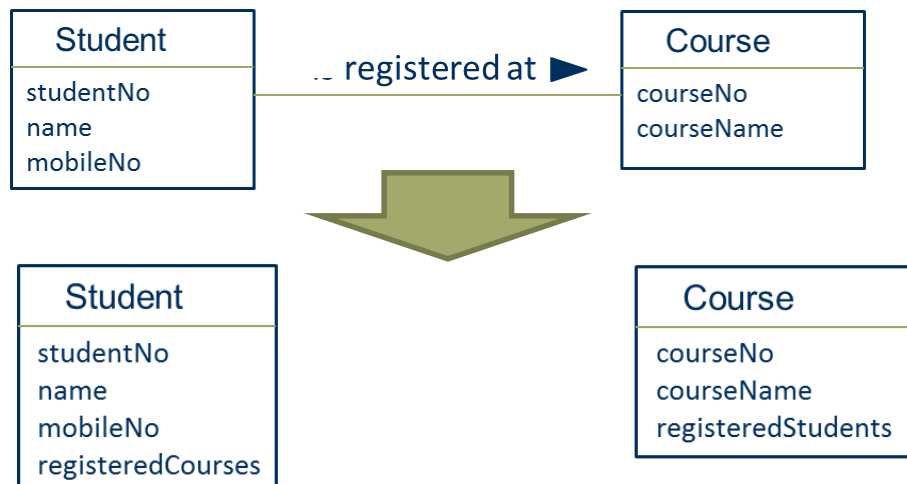
# Association

- There could be more than one association between the same classes (therefore, naming of association is important)



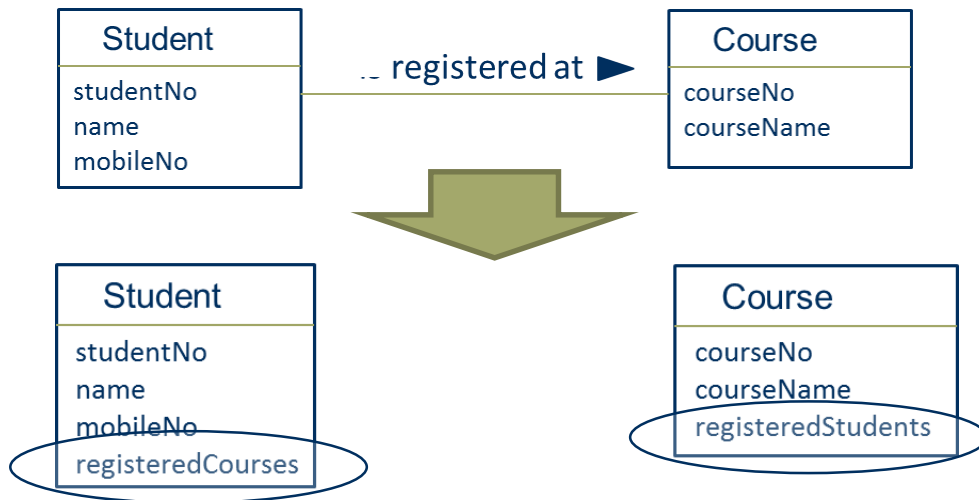
# Association

- Attribute and association are both properties of a class, so if an association is not shown it needs to be represented as attribute in the both of the classes (since an association has two directions)



# Association

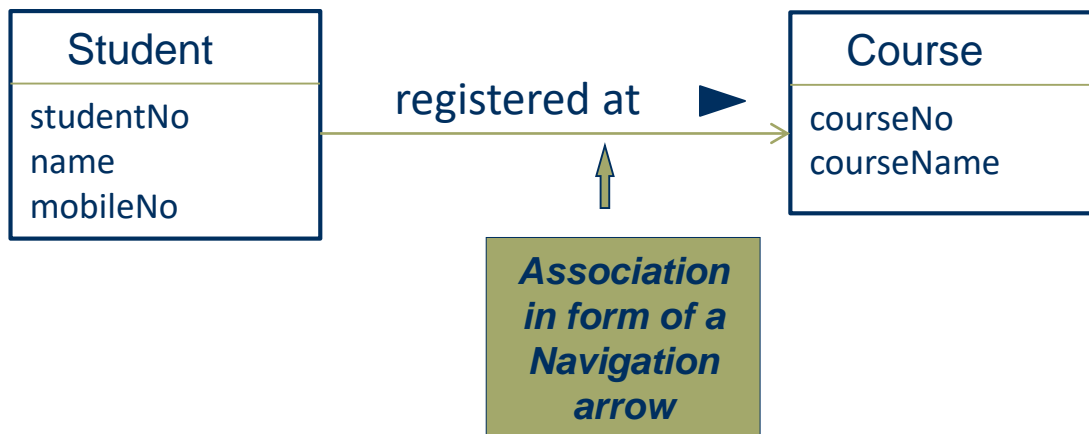
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# Association

- It is possible to specify that an association only has one direction by introducing a navigation arrow – but that should not be used in this course



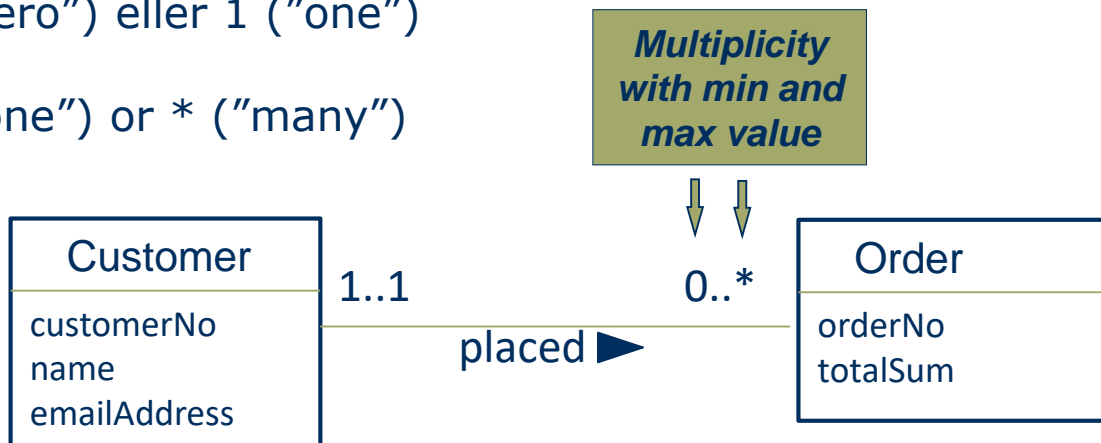
# Multiplicity

- Multiplicity describes how many objects (minimum and maximum) of a class that can be linked to objects of an other class – in both directions of the association
- Minimum can be 0 ("cero") eller 1 ("one")
- Maximum can be 1 ("one") or \* ("many")

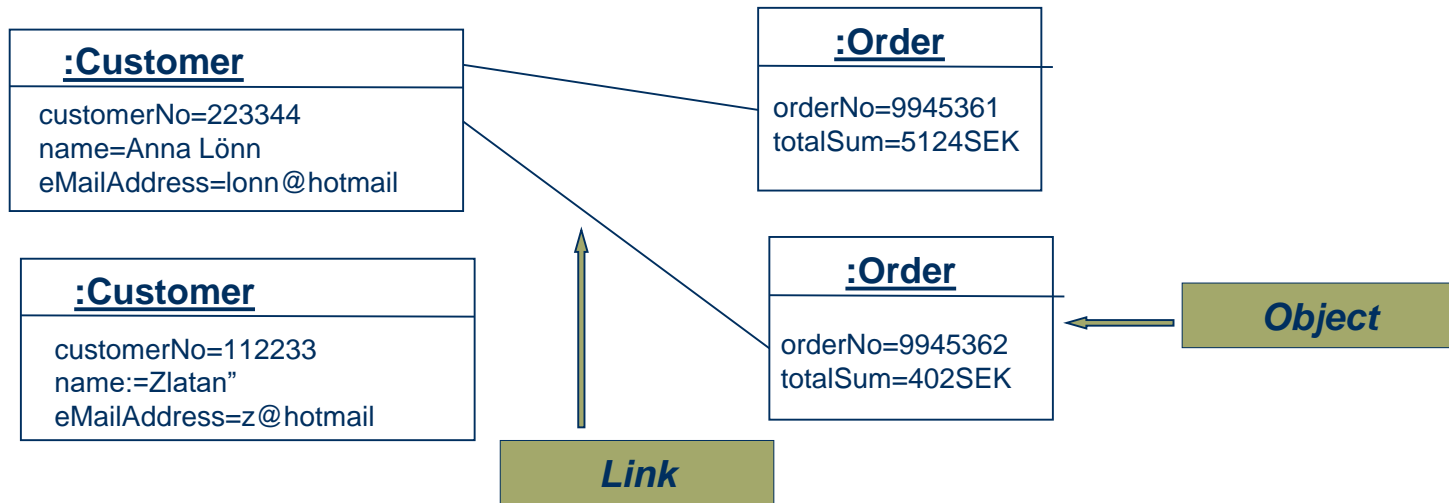
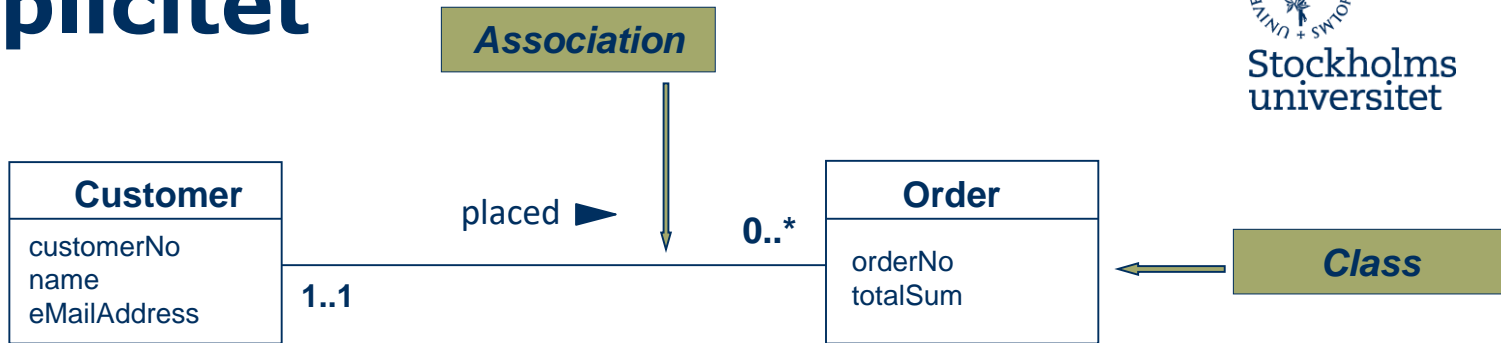


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# Multiplicitet



# Multiplicity

- *Multiplicity in the direction from Customer to Order:* An object of a class Customer can minimum be linked to 0 and maximum to many
- *Multiplicity in the direction from Order to Customer:* An object of a class Customer can minimum be linked to 1 and maximum to 1, that is, exactly one



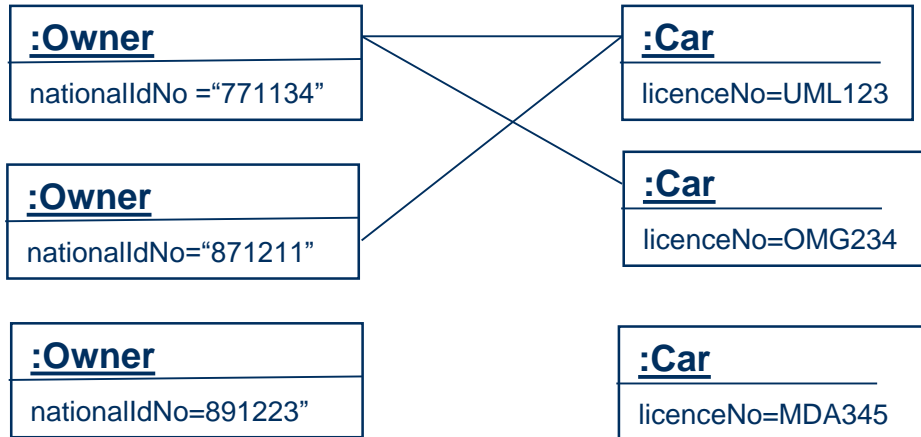
# Multiplicity

- A guideline to use for helping you deciding multiplicity:
- Use the phrase: **"One object of Customer is linked to minimum {zero or one} and maximum {one or many} object(s) of Order"**, and (in the other direction): **"One object of Order is linked to minimum {zero or one} and maximum {one or many} object(s) of Customer"**



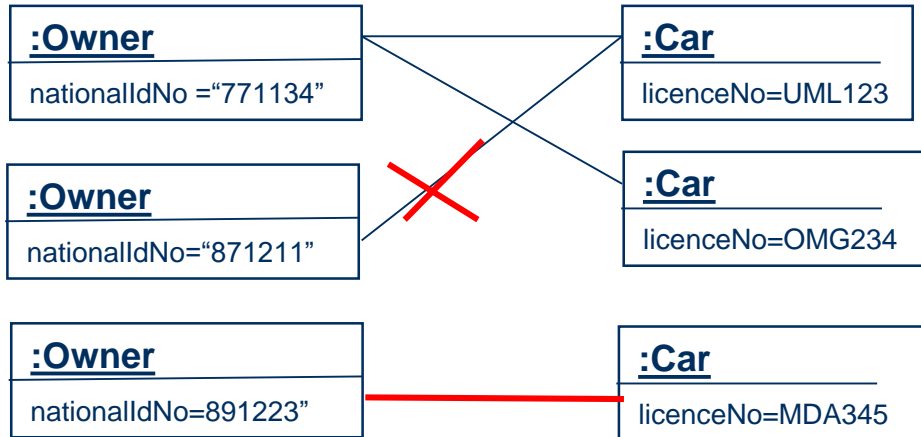
# Multiplicity Exercise

*Your task:* Find the violation of multiplicity rules and correct the multiplicity



# Multiplicity Exercise

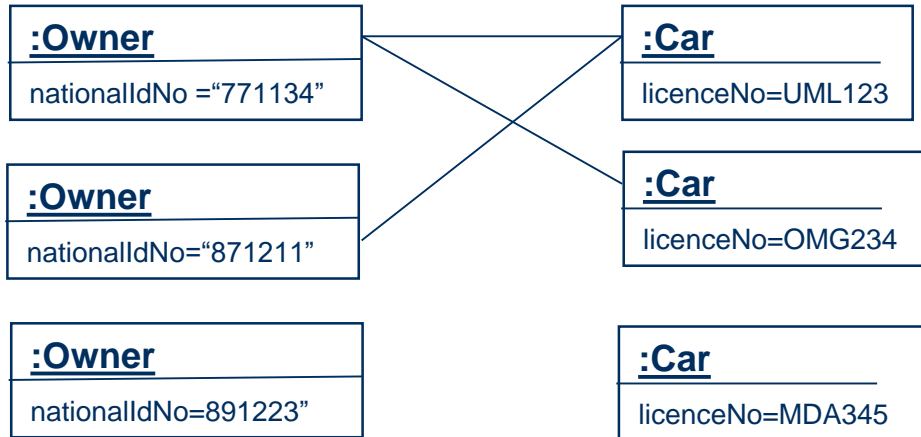
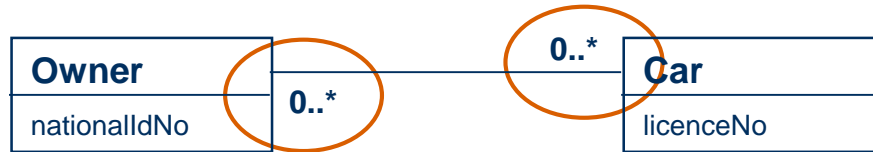
Your task: Find the violation of multiplicity rules and correct the multiplicity





# Multiplicity Exercise

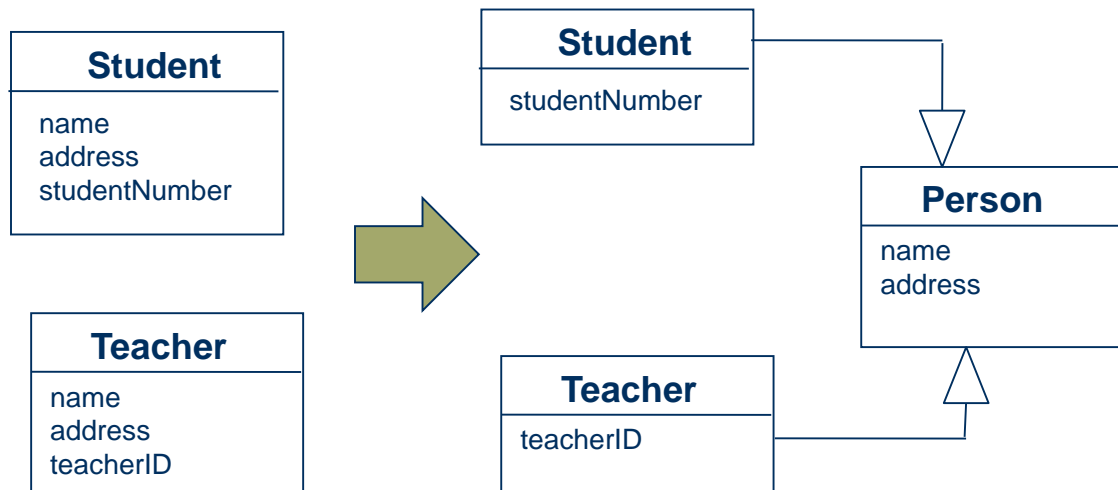
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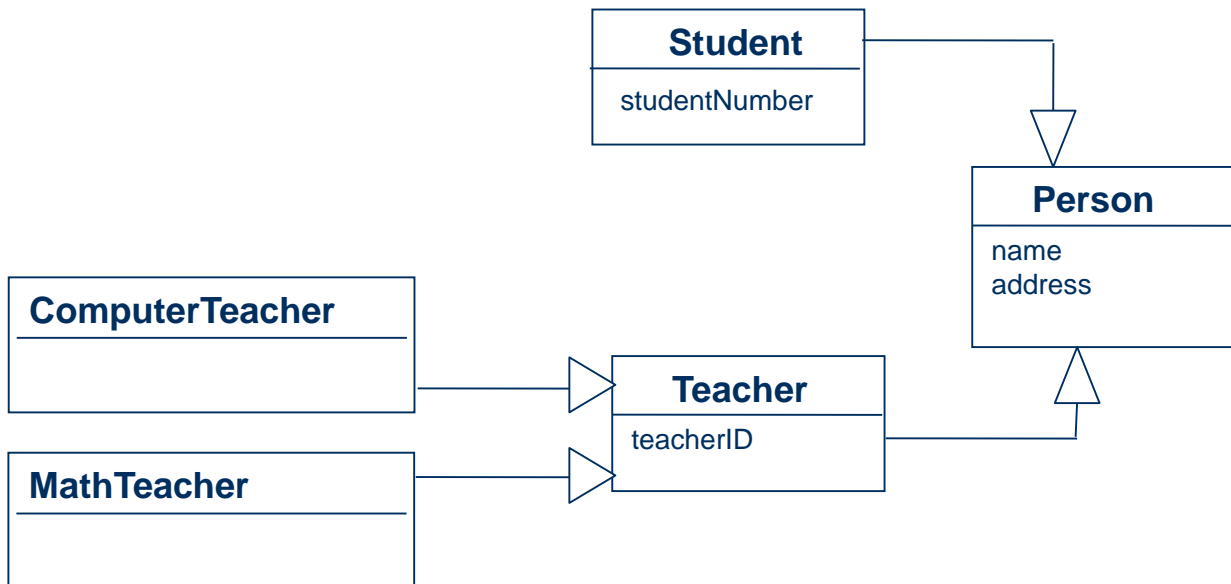
# Multiplicity

- Commonly, multiplicity described business rules in the organization (for example, a order must be placed by exactly one customer)

# Modelling Generalization in UML



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# Questions to answer

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