Modeling Exercise: DVD Rental

- Imagine a classical DVD rental shop.
- Each customer can rent up to 10 DVDs.

- DVD rental
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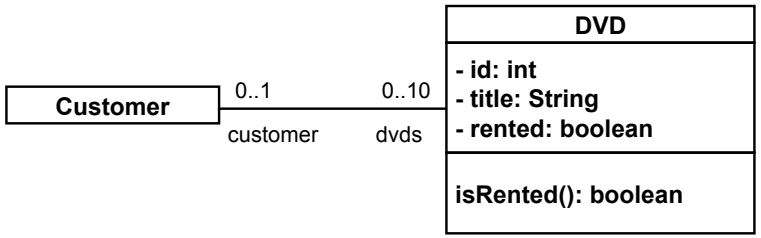
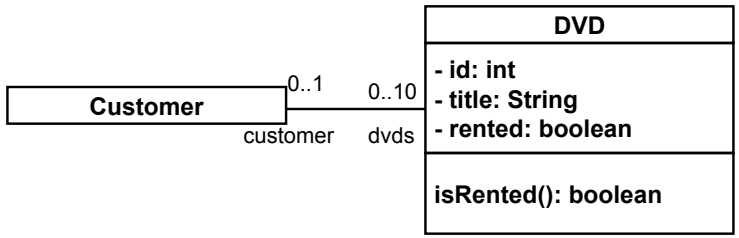
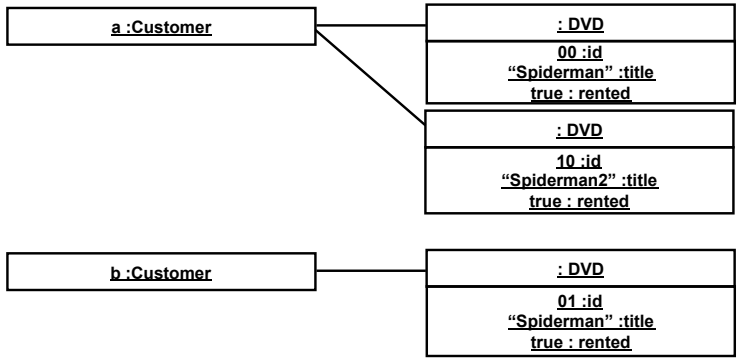


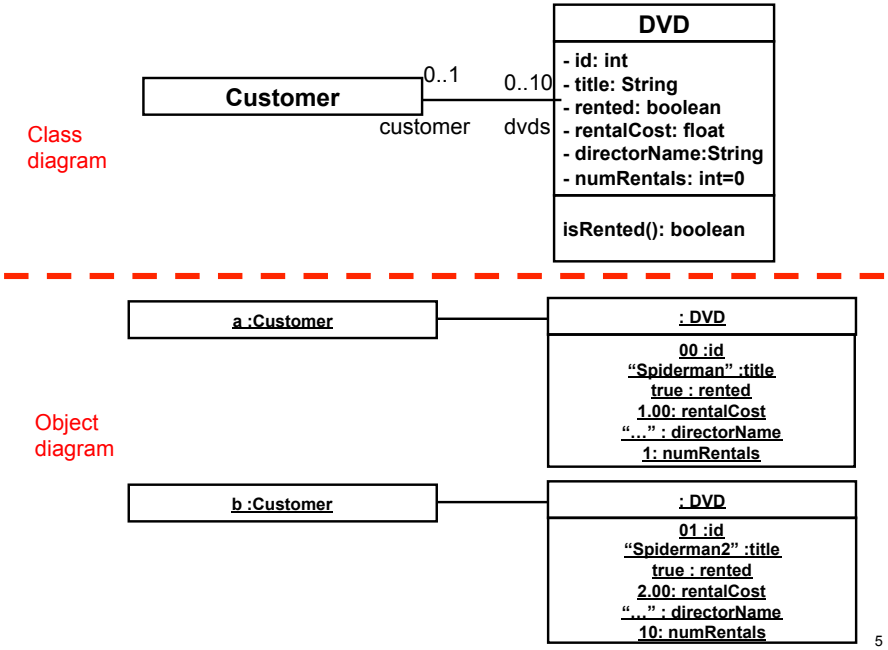
Class diagram



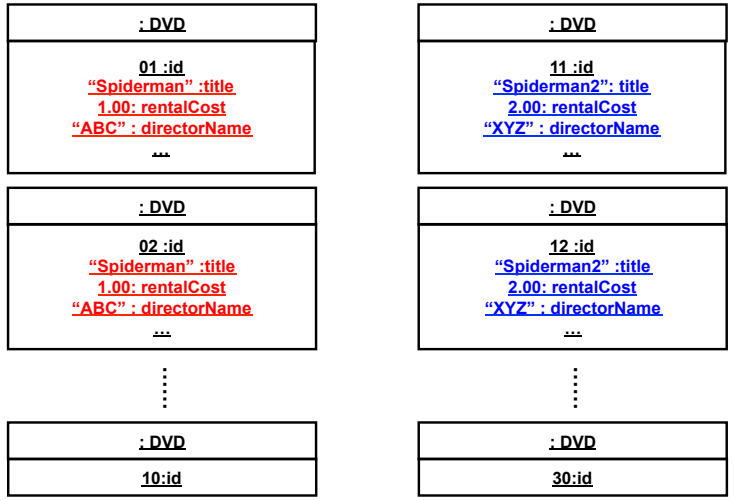
Object diagram



- What if…
  - you need to maintain individual DVD's properties?
    - Rental fee, total # of rentals in the past, production company, distribution company, distribution year, director's name, rating (R-rated, PG13, etc.), etc., etc.



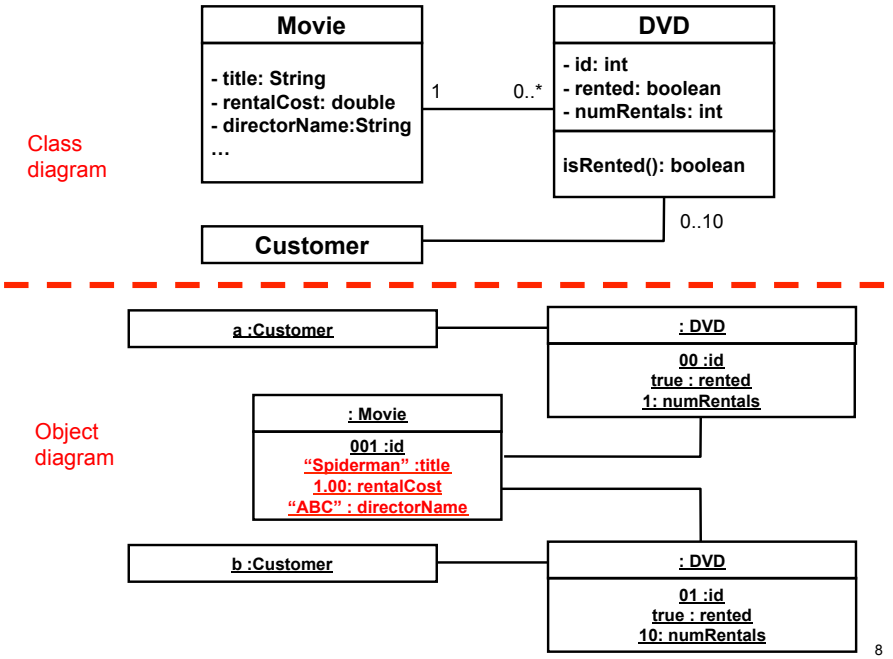
- How can we remove redundancy?
  - The total # of instances = # of physical DVD media = 30
    - 6 * 30 properties in total.
  - 10 instances share the same set of property values, except for ID.
  - 20 instances share the same set of property values, except for ID.



- Why is redundancy bad?
  - It leads to a fragile design for changes.
    - A single change can impact many places in a system.
      - What if rentalCost changes…
    - Those places may fail to be in sync as software size/complexity increases.

- How can we remove the redundancy?
  - Localize, modularize or minimize the impacts of a change

- Separate things from their types/kinds.
  - Separate individual/physical DVD media (containers) and movies (contents).



Exercise: Insurance Products

- Each customer (insured) can buy multiple insurance products.
  - e.g., home owner's/renter's insurance, automotive insurance, boat insurance, life insurance…
  - The properties of each insurance product:
    - Product name, insurer's name, deductible, annual premium the amount of year-to-date payments, policy number, agent's name, policy term (e.g., 09/01/07 to 08/31/08)
  - Let's take an insurance agency's viewpoint.

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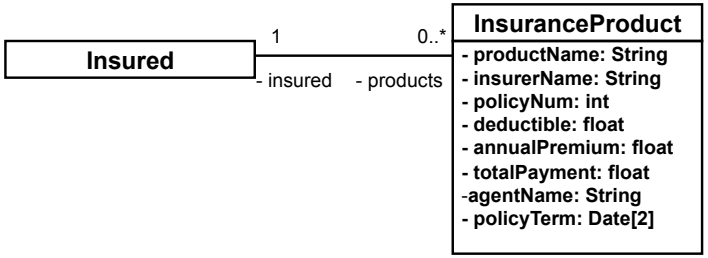
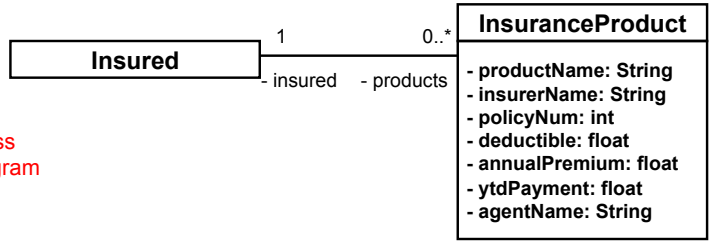
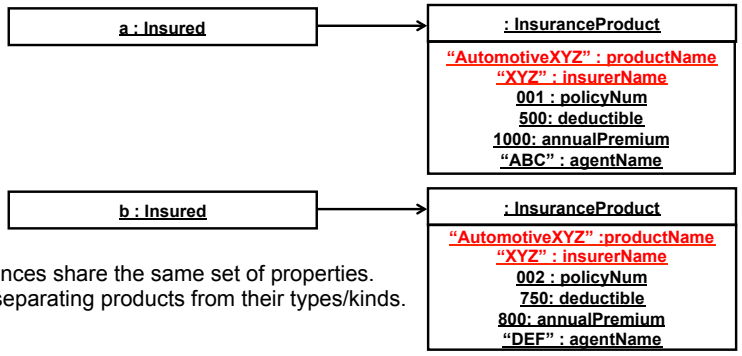


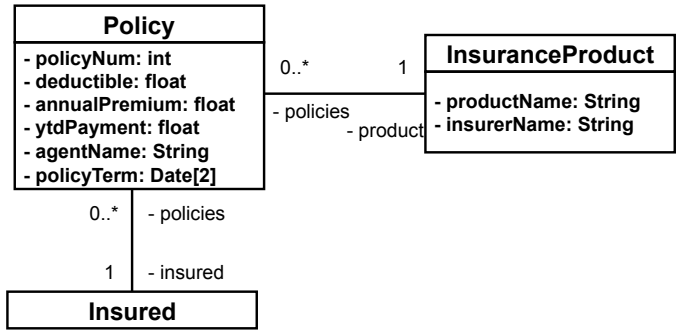


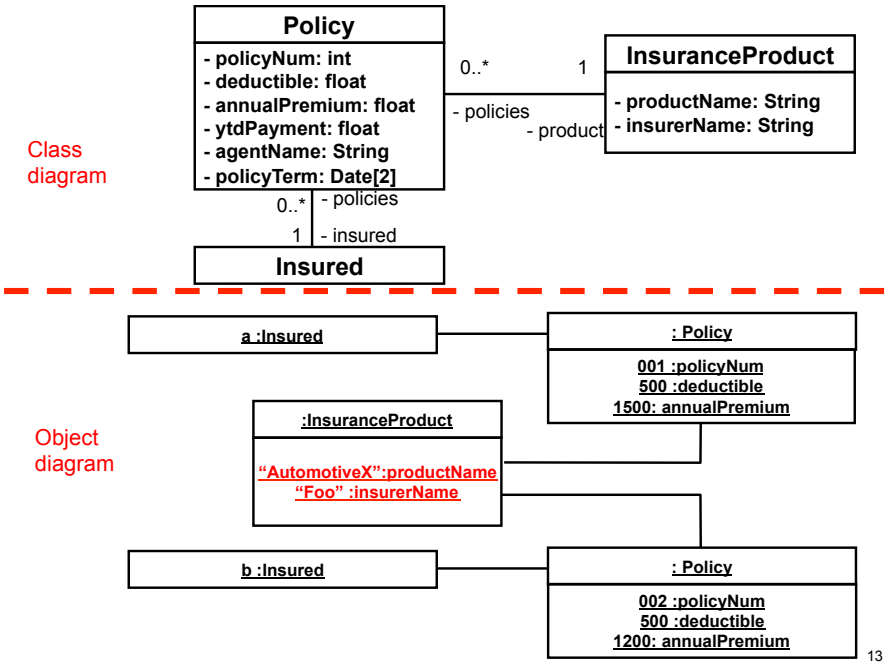
Class diagram



Object diagram

Two instances share the same set of properties.
Think of separating products from their types/kinds.

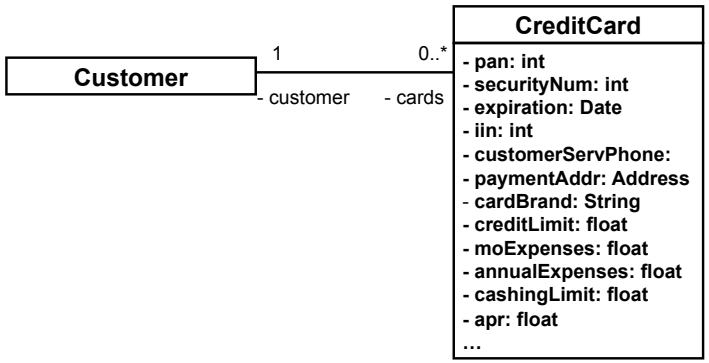


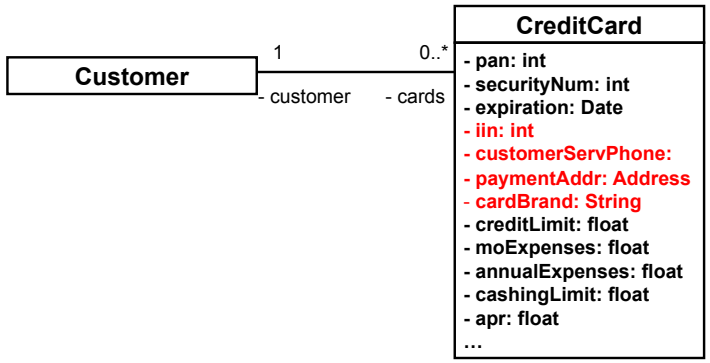


Exercise: Credit Cards

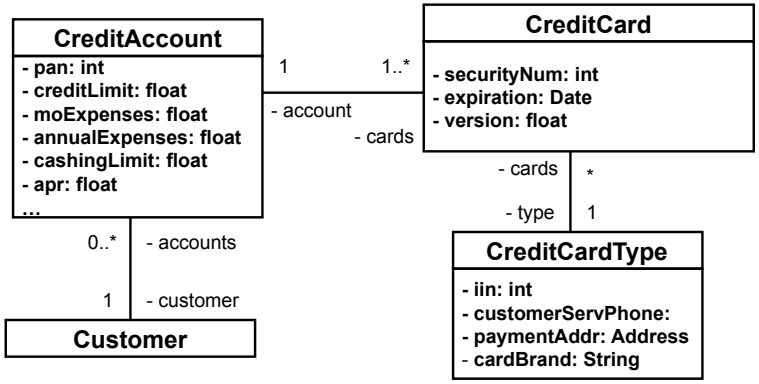
- Each customer can have multiple credit cards.
  - The properties of each card:
    - Issuer (bank; e.g., Chase, Citibank, etc.), brand (Visa, MasterCard, Amex, etc.), card number (primary account number: PAN), issuer identification number (IIN), security number, expiration date, monthly credit limit, monthly cashing limit, month-to-date expenses, year-to-date expenses, payment address, customer service phone number, finance charge APR, etc. etc.

- Let's take an issuer's (bank's) viewpoint.

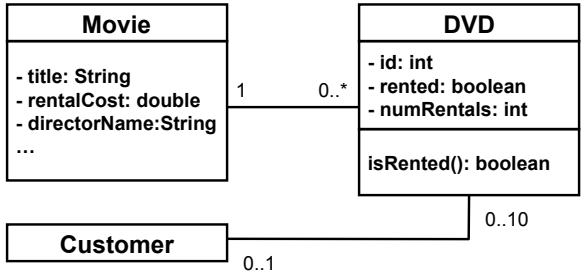




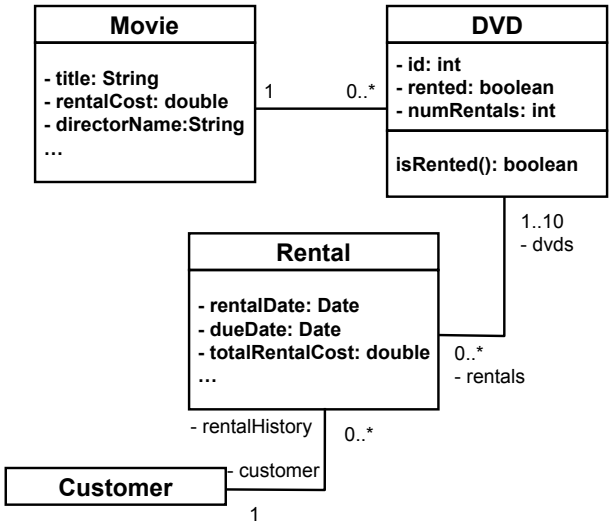
Instances share the same set of properties.
Think of separating credit cards from their types/kinds.



Revisiting the DVD Example



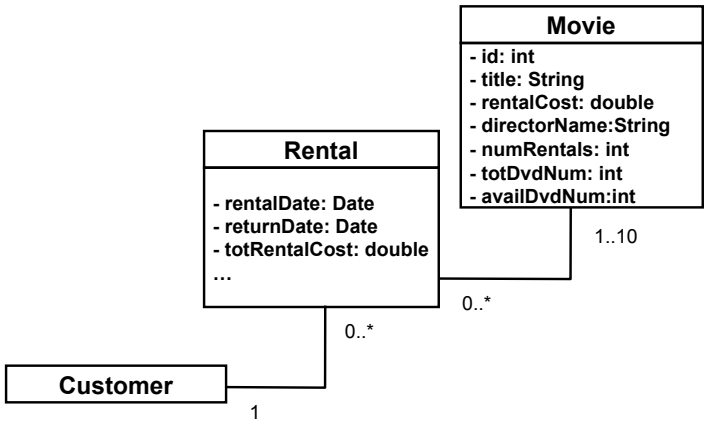
- How can you keep each customer's rental history?
  - 2 DVDs rented 2 weeks ago, and returned last week
  - 5 DVDs rented last week, and not returned yet
  - 3 DVDs rented today

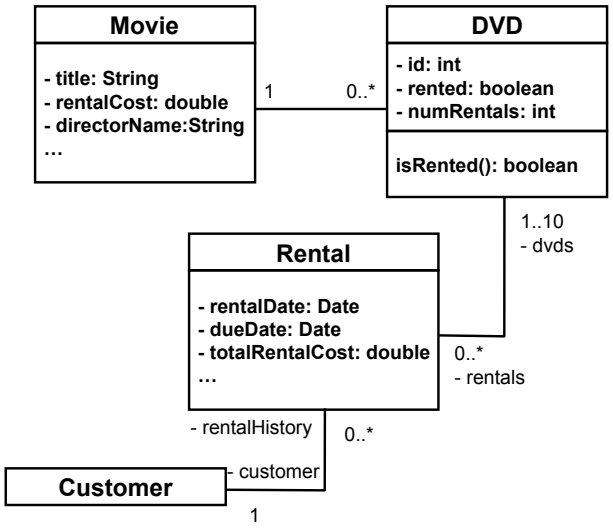


By the way…

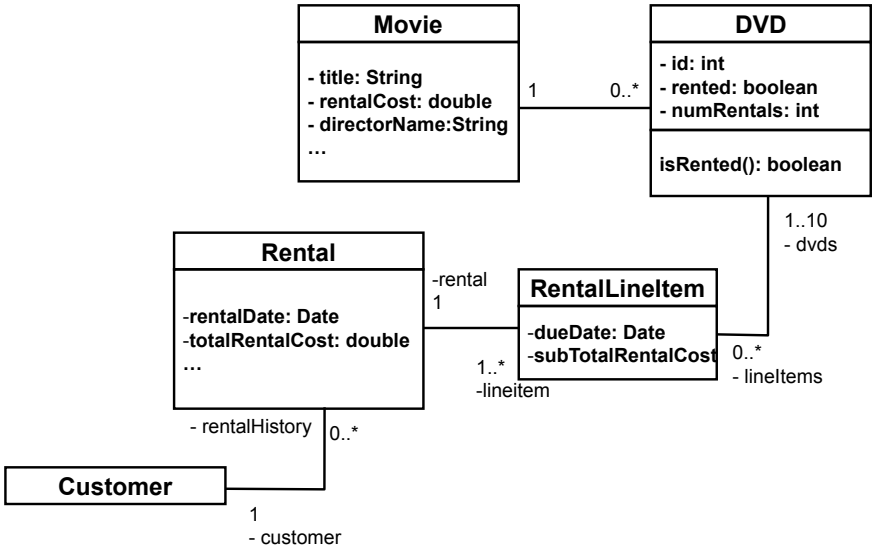
- Do you really need to model physical DVD media?
  - Maybe
    - Rigorous property management to keep track of individual DVD media
      - Who is renting which DVD media?
      - When was each DVD media purchased/created/disposed?
    - Quality management for DVD media
      - Disposing DVD media when it has been rented certain times.
    - Sharing DVD media among different DVD stores
    - cf. car rental, car dealer, book rental (library) and credit cards — you need rigorous property management.
  - Maybe not
    - Simpler property management
      - c.f. Netflix
      - Particularly for sales businesses rather than rental businesses.
        - » Book stores (e.g., Amazon.com)

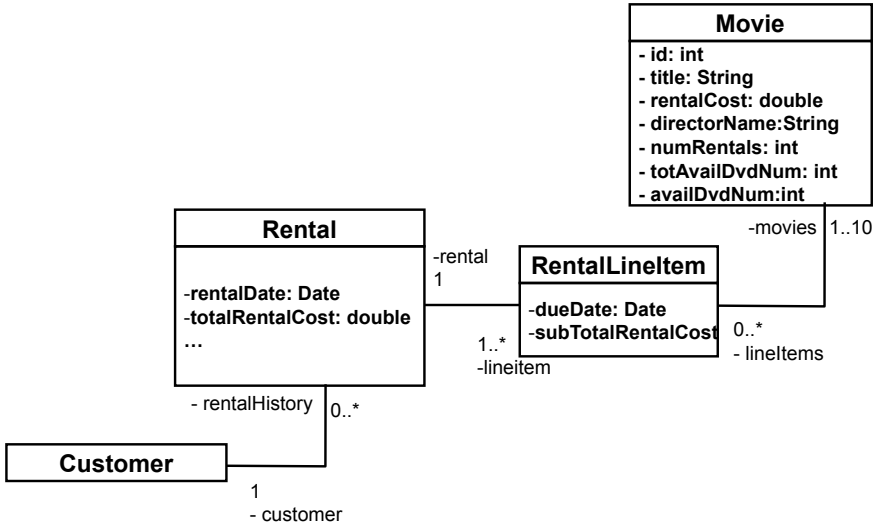
- Simpler DVD media management



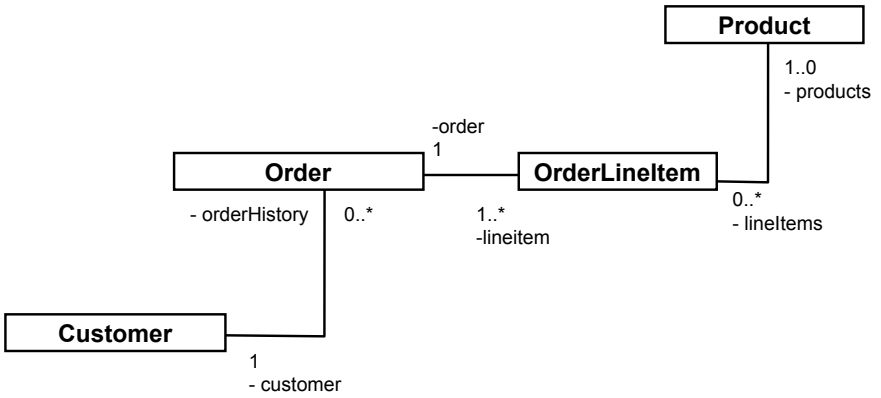


- What if different DVD media have different due dates?





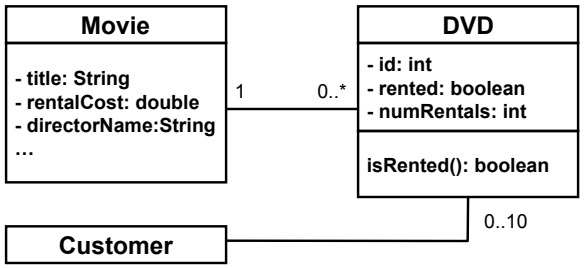
Product Sales



HW5-1

- Choose the insurance or credit card example and add more details to it based on your own insurance policies or credit cards.
  - Make the example model more detailed/realistic
  - Draw a class diagram and an object diagram
  - Write code for it with a simple test code.

Class diagram



Object diagram