



ASSIGNMENT (AFLEVERINGSOPGAVE) 7

GENERAL INFORMATION

This assignment is made public on Friday, March 19th, 1 PM. The assignment is due on
Friday, March 26th, 1PM.

Hand in your assignment to the teaching assistant running your lab session.

The first page of your (written) assignment has to contain at least the following information:

- the course name (Grundlæggende Programmering)
- name and student number of the fellow student(s) in your group (max two)
- assignment number

Please staple your assignment!

You will get back the graded assignment one week after submission deadline.

WARM-UP AND SUGGESTIONS FOR FURTHER EXERCISES

As a warm-up I suggest the review questions from Chapter 7 on Inheritance (pp. 265–267 of my copy of the textbook).

If you want to do further programming exercises I suggest the following ones from the book (pp. 267–268):

- Exercises 1–4 are about simple additions to programs introduced and used in Chapter 7 of the book.
- Exercises 5 and 6 use arrays which we have not yet covered.
- Exercises 9–10 and 16 are modifications of class `Counter` that we have met before.
- Exercises 11–15 relate to the longish example of Section 7.8.

It is up to you whether or not you want to work on these exercises. Those exercises will not be marked.

ØVELSER

Arbejd i små grupper.

- Review questions 11, 12, og 13 fra side 266.
- Klasse `Person`: Opgave 1, 2 fra kapitel 7.
- Klasse `Counter`: Opgave 9, 10, 16.

ASSIGNMENT: SHIPPING CONTAINERS

This question is taken from the IPBR exam E2003, January 2004.

A shipping container (SC) is a container made from steel to transport goods. The size of these containers is standardized to facilitate storing and transporting them. The pictures below show in the first row typical shipping containers, and a container set up for transporting liquids in the second row. Here, a tank is built into the standardized frame.



In this question we will implement classes representing shipping containers.

1. A shipping container is determined by its size (height, width, length), its tare weight (weight without load), and its gross weight (maximal weight including load). The width of a shipping container is standardized to 2.5 meters. Show the code of class SC (shipping container) with the following specification:

SC
-height: double -WIDTH: double -length: double -tare: double -grossWeight: double
SC(double height, double length, double tare, double grossWeight)
getMaxPayload(): double getVolume(): double getHeight(): double getLength(): double

The constructor takes the various parameters and sets the instance variables accordingly. Moreover, the instance variable WIDTH is set to 2.5 (meters). The method `getMaxPayload()` returns the maximal weight of goods (as difference of the gross weight and the tare) that can be loaded in the shipping container. The method `getVolume()` returns the (maximal) volume of goods that can be transported in the shipping container. The methods `getHeight()` and `getLength()` return the height and length of the shipping container.

2. Variable WIDTH of class SC holds the same value for all objects of the class. Should the variable be declared as `static`? What would be the difference?
3. A *reefer* is a shipping container with installed cooling system used to transport for example fruits. Implement a subclass `Reefer` of class SC which has an additional instance variable `temperature` holding the minimal temperature that the cooling system can reach.

There should be one constructor taking as variables the height, length, tare, gross weight and minimal temperature of the cooling temperature setting the variables accordingly. In addition there should be a method of signature `double getTemperature()` that returns the minimal temperature of the cooling system.

4. A *tank container* consists of a tank to hold liquids which is mounted inside a shipping container frame (see the picture above). The volume of load that can be transported in a tank container is determined by the volume of the tank. Implement a class `TankSC` extending class `SC` which has an additional instance variable `volume` representing the volume of the tank mounted inside the shipping container. The class should have a constructor taking as arguments the height, the length, the tare, the gross weight and the volume (of the tank) and setting the instance variables accordingly. There should also be a method `double getVolume()` that returns the volume of the tank.
5. A *tank reefer* is a tank container that also holds a cooling system to cool down the liquid transported in the tank mounted inside the frame. Thus, a tank reefer has properties of both a reefer and a tank container. Discuss alternatives for implementing class `TankReefer` in Java. Use correct Java jargon in your answer.
6. (This was not part of the exam question.) Show at least one implementation of class `TankReefer`.

HVAD SKAL AFLEVERES: Aflever koden af klasserne `SC`, `Reefer`, `TankSC` and `TankReefer`. Aflever også svaret til spørgsmålet 3 om variabelen `WIDTH` og til spørgsmålet om forskellige muligheder til at implementere klassen `TankReefer`.