

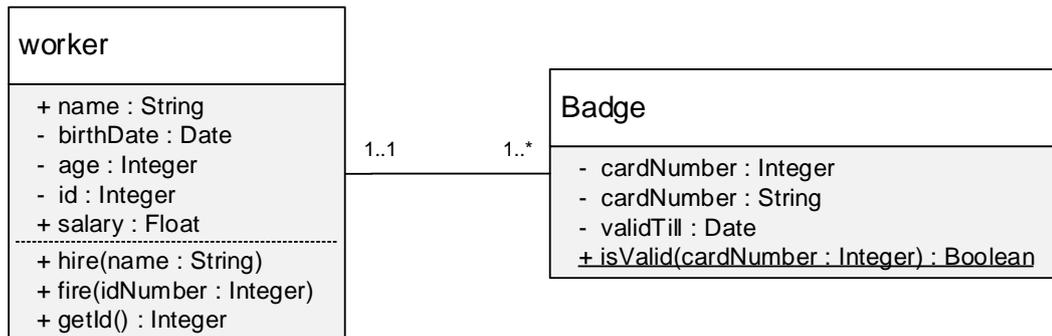
Question: Unified Modeling Language

This homework sheet will test your knowledge of the Unified Modeling Language ((ML). Specifically, this includes the understanding of class, object and activity diagrams.



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a) Name at least 4 errors and 4 points for improvement in the following class diagram.



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b) Draw a simple class diagram specifying the relationship between cars and motor-cycles. Make sure you model the following:

- Each vehicle has a make, horsepower, price and build year and can be bought
- Cars can be a convertible or not
- A motorcycle can be motocross or not
- Cars can be leased

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c) Use your class diagram from the previous exercise to draw an object diagram. Model the following:

- Cars:
 - Mercedes with 180 horsepower
 - One from year 2014 for 60,000.00 EUR
 - Another one from year 2004 for 8,000.00 EUR
 - The newer one is a convertible
- Motorbike:
 - A Ducati with 80 horsepower from the year 2001
 - Sold for 6,000.00 EUR

- Is not for motocross

If necessary, you can retrieve additional resources on object diagrams online.

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- d)** Describe the difference between composition and aggregation and give an example for each. Your example should be different from the one provided on the slides.

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- e)** Draw an activity diagram for solving an exercise sheet. Make sure to include the following ideas:

- You are done if no tasks are unsolved.
- While you solve the sheet, you look up concepts you do not know.
- You first have to download the exercise sheet.
- When you are done, you file your results.

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- f)** Create a use case diagram for a car dealership using the following elements:

- Customer
- Salesman
- Manager
- Test drive
- Inspect car
- Provide details for a car
- Reorder sold cars
- Buy car
- Pay for car
- Arrange installment payment

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- g)** Use your class diagram for the vehicle from exercise (b) and implement it using Reference Classes in R. Only implement Car and Vehicle. The methods shown in the UML diagram should only print a statement that they were called.

After implementing the classes, create an object that represents the following car:

- Make: Mercedes
- Horsepower: 150

- Price: 20,000.00
- Build year: 2009
- Is a convertible

Finally, call both methods of the object to see if `lease()` and `buy()` work correctly.