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NAME: \_\_\_\_\_

**CS 1410-20**  
**Mid-Term 1**  
**September 29, 2010**

You have 50 minutes to complete this in-class, open-book, open-notes, closed-computer exam.

The exam consists of a single programming question, below. Write your answer on the other side of this page; additional pages and a stapler are available for those who want them. A complete solution fits on a single page with average handwriting.

This exam is about concepts and style, not the fine details of the Beginner Student language. Consequently, you will lose no points for minor syntactic mistakes, such as a missing parenthesis. However, you will lose significant points if your function implementation does not match the shape of your data definition.

**Question**

A freight train consists of a sequence of cars. The cars are in a particular order, each car is either a flatcar or a boxcar, and each car contains a certain number of tons of freight.

The train company needs to keep track of trains. In particular, a train is occasionally robbed. The robbers take everything from all boxcars (which contain relatively small freight), but leave the flatcars alone (because they contain large items such as steel beams).

Thus, the train company needs a data representation for trains. It also needs a function `rob-train`, which takes any train and returns a train where all of the boxcars are empty.

**Design a data representation for trains and implement `rob-train`.**

Show all steps in the design recipe.

Since you provide the data definition, we expect variation in solutions. However, your data definition must include all of the information about a train that the company considers relevant: the number and order of cars in the train, the kind of each car, and the amount of freight in each car.