Homework 3

Due dates:

```
MWF section: Wednesday, November 15, 11:59 p.m. (i.e. midnight)
TR section:  Thursday, November 16, 11:59 p.m. (i.e. midnight)
```

Instructions:

This is a pair assignment. Please find your own partner. As each section has an odd number of students, in each section someone will not have a partner. If you do not have a partner, communicate with me and I will act as partner broker. You must do so quickly; I can't undertake to find a partner/group for you when the deadline is upon us.

There are two problems and two of you. Please resist the temptation to divide them up 50:50; instead, work on both together. Your solutions will be better if you work together, and your learning will be better if you work together. That's why we're pair-ing. Furthermore, one of the problems is significantly easier than the other.

You must turn in your answers on a separate sheet of paper, written legibly and with adequate spacing so that I can easily determine what your answer is. Produce your answers using whatever drawing tool you prefer. If you wish, you may hand-draw your solutions using paper and a dark writing tool.

To turn in your work, produce a pdf from your drawing tool. If handwritten, you may scan it and submit a pdf (preferred) or a jpg file *if you have no means of producing a pdf.* The jpg is the least preferred because (a) it is often very dark in the background and difficult for me to read, and (b) it can be difficult for me to print. If you elect to turn in a jpg, please review it before turning it in and decide if you consider it readable.

Once you have produced your finished work, use the `handin` command appropriate to your section to submit it:

```
handin ebuckale mwfHW-03 <file>
handin ebuckale trHW-03 <file>
```

Problem 1: Online Auctions Database

Consider the operations of an online auction company that offers members the ability to buy and sell items. The seller lists the item for sale, including in the listing a description, a starting price, and a bid increment. For simplicity, the shipping mode and price are set by the seller and are fixed. Also for simplicity, assume items are listed individually. Other information includes the item's category and a title for the listing. The auction end date and time are set automatically.

Beside the items listed for auction, information is needed about the members. The members are not categorized as bidders or sellers; all functions are available to all members. For members, information needed is a userid, password, name, address, telephone number, and email address.

Member ratings are also supported. Ratings are connected to a particular auction and also include buyer identification, seller identification, a buyer comment, a seller comment (may be a response, or an unsolicited rating of the buyer) and two ratings: one from the buyer and one from the seller.

As your development progresses, you should consider how you would implement the following functions using your design and your tables:

Member Functions	Administrative Functions
Submit item for auction	New Registration
Bid on an item	Member Login
Search for items	
Enter a rating	
View ratings	

Of course you will not even *dream* of implementing these functions. You are simply to consider if they could be implemented using your relations.

a. Develop an ER diagram for the company's needs.

b. Map your ER diagram to a set of relations.

Problem 2: Library Database Application

Consider the operations of a public library system in a city. The library has many patrons who borrow books from any of its many branches and return them at any branch they find convenient. Each branch of the library holds a number of copies of a particular book. Books that are not returned on time are fined at a rate of 25 cents for each day after the due date. We are not concerned about other items that the library may have in its inventory, e.g. DVDs, CDs, archived material (viz. VHS or cassette tapes or floppy diskettes or magnetic tapes or ...).

The library will need to have information about its book operations. For each book, the database will store a unique book ID, a title, its publisher, and its author information. In addition, each branch needs to know how many copies it has of each book.

Of course we also need information about the branches, including branch ID, branch name, and branch address. Other possible information includes phone numbers and hours.

Since the primary purpose is to manage book loans, information about book loans is also stored. For book loans, we must know the book ID, the branch ID, the card number of the patron, the date checked out, the date due, and the date returned. Note that there may be more than one copy of any book at any branch, and that copies are managed individually.

Of course we also need to manage our patrons. Information needed for our borrowers includes personal information: patron name, patron address, and phone number. For our library management, we need additional information: card number and unpaid dues (or, if you prefer, balance.))

Your relations should be able to easily accommodate the following set of functions:

Patron Functions	Administrative Functions
Book checkout	Add a new book
Book return	Update book holdings (e.g. new copy)
Pay fine	Add new patron
Print loaned books list	Print branch information
	Print list of the ten most popular books
	Communicate with publisher
	Communicate with author

Of course you will not even *dream* of implementing these functions. You are simply to consider if they could be implemented using your relations.

a. Develop an ER diagram for the library's needs.

b. Map your ER diagram to a set of relations.

c. Extend your ER diagram to allow the library to fine-tune its circulation policy. There will now be different categories of books and the book categories will have different loan periods. Reference books will not circulate at all; non-fiction will be loaned for one week; all other books will have a two-week loan period.

d. Modify your relations to accommodate this change.