

198:336 Spring 2005
Sample Midterm Questions

The following representative midterm questions were discussed at the class meeting Wednesday March 9.

Problem One

After you buy a book on Amazon.com, the interface tells you about other books you might be interested in.

For example, suppose someone has just bought a book with isbn 123-45. The interface will find other books that people who bought book 123-45 also bought.

Write an SQL query that might be behind what the interface does in this example. Assume this schema:

orders(oid: integer, cid: integer)
contains(oid: integer, isbn: string)

(Here oid identifies an order, cid identifies a customer, and isbn identifies a book.)

Problem Two

Express the relational query “people who bought book 123-45 also bought —” (from Problem One) in the relational algebra, using the operators:

$\sigma_c(R)$ - select the rows from R matching condition c
 $\pi_c(R)$ - project the columns c out of relation R
 $R \bowtie S$ - the natural join of relations R and S

Problem Three

Explain why a traditional bricks-and-mortar store, like a grocery store, would not normally be able to build a database from full-price cash transactions that could answer this query. What is the best evidence that the store could get in this case about what products are purchased by the same people? How does giving customers a free “club card” solve this problem?

Problem Four

How is it that a business could successfully offer customers discounts for using a free club card? Wouldn't a business that just charged the discounted prices all the time be more economically competitive?

The following sample questions are also more-or-less representative of what you might be expected to do on a midterm. (Actually you won't find questions on a midterm that build on each other the way these do. On an actual midterm, the questions will be all more or less separate, as with the in-class example. This makes grading easier and fairer. But that doesn't matter for a practice problem.)

Another Problem One

Draw an entity-relationship diagram for a database of pizza orders. Assume that pizzas are identified by integers, and have a size, a base price and the customer id of the customer who bought them. There are also entities for toppings, which have identities, names, and a fixed price that must be paid to add them to any pizza. Individual pizzas may include a set of toppings.

Another Problem Two

Describe a schema for the E-R diagram of Problem One in the relational database model.

Another Problem Three

The total price of a pizza is its base price plus the sum of the prices of all its toppings. Assuming the schema of Problem Two, give an SQL query that will construct a new table of pizzas and their total prices.

Hint: in a select statement, you can use mathematical expressions in describing the column-values to select as well as in the *where* and *having* clauses.

Another Problem Four

Imagine you are a pizza delivery service. You have caller id linked into your database, so you automatically acquire the phone number of anyone who places an order. What assumptions best describe the real-world relationship between phone numbers, customers, and delivery locations? Hint: consider residential land lines, cell phones, and phone numbers for large businesses that might order lunches for various purposes (like the Rutgers computer science department).

How do you balance the goal of not asking repeatedly for information over the phone and not delivering pizza to the wrong place?