

CSCI-4380 Database Systems

Lab 2

This lab will focus on the use of relational algebra to query a relational schema, as well as concepts related to functional dependencies.

You will have twenty to thirty minutes of time during the lecture to complete it, but it's not due on Submittity until 12:00pm (noon) on January 24.

You may work in teams of up to three (3).

1. Assume the existence of a database with the following relations:

Ingredient(name, calories, cost, containsNuts)

Recipe(name, ingredientName, amount)

Menu(recipeName, season)

which is used by a restaurant to manage its menu items. Assume that all amounts are in the same unit (e.g., grams) and that:

$$\pi_{ingredientName}Recipe \subseteq \pi_{name}Ingredient$$

$$\pi_{recipeName}Menu \subseteq \pi_{name}Recipe$$

Two facts that may be helpful to remember:

- the natural join (\bowtie with no condition) will pair tuples that agree on attributes with the *same name*.
- recipes that contain nuts may also contain some ingredients without nuts

Write relational algebra expressions for the following:

- (a) (3 points) List the names of all recipes on the menu for the Spring and Summer seasons

- (b) (3 points) List the names of the recipes on the Winter menu that contain nuts

(c) (4 points) List the names of the recipes on the Fall menu that *do not* contain nuts

2. Assume the relation $R(a, b, c, d, e, f)$ with the following FDs:

$$b \rightarrow c$$

$$ab \rightarrow de$$

$$c \rightarrow f$$

(a) (2 points) Find the key(s) of R

(b) (3 points) Compute $\{ac\}^+$. Show your work.