

CS127 Homework 2

Due: September 24th, 2014 3:00PM

Grading Information

Grading for the homeworks is as follows:

- Warmup problems will be graded as one of ($\checkmark+$, \checkmark , $\checkmark-$)
- All other problems will be graded in detail and will be given a numeric score.

Solutions for the warmup problems will be provided along with your graded work.

Warmup 1 (Textbook Problem 6.5)

Let the following relational schemas be given:

$$R = (A, B, C)$$

$$S = (D, E, F)$$

Let relations $r(R)$ and $s(S)$ be given. Give an expression in the tuple relational calculus that is equivalent to each of the following:

- $\Pi_A(r)$
- $\sigma_{B=17}(r)$
- $r \times s$
- $\Pi_{A,F}(\sigma_{C=D}(r \times s))$

Warmup 2

Consider the following database:

$$employee = (\underline{person_name}, street, city)$$

$$works = (\underline{person_name}, company_name, salary)$$

$$company = (\underline{company_name}, city)$$

$$manages = (\underline{person_name}, manager_name)$$

Give expressions in tuple relational calculus and Datalog for each of the following queries:

- Find the names of all employees who work for First Bank Corporation.
- Find the names and cities of residence of all employees who work for First Bank Corporation.
- Find the names, cities of residence, and street address of all employees who work for First Bank Corporation and earn more than \$10,000.
- Find the names of all employees in this database who live in the same city as that in which the company for which they work is located.

Warmup 3 (Textbook Problem 7.3)

Design an E-R diagram for keeping track of the exploits of your favorite sports team. You should store the matches played, the scores in each match, the players in each match, and individual player statistics for each match. Summary statistics should be modeled as derived attributes.

Warmup 4 (Textbook Problem 7.29)

Explain the distinction between total and partial constraints.

Problem 5 (To Be Graded)

Consider again the simplified university registrar database from Homework 1:

Student			Course			Enrollment			
name	gradyear	gpa	title	semester	instructor	name	title	semester	grade
Amy	2016	3.95	CS33	2014F	Doeppner	Eliza	CS33	2014F	A
Ben	2015	3.87	CS127	2014F	Zdonik	Eliza	CS127	2014F	A
Carl	2016	3.29	CS195	2013F	Kraska	Ben	CS127	2012F	A
Dan	2017	3.43	CS127	2012F	Zdonik	Carl	CS195	2013F	C
Eliza	2015	4.0	CS136	2012S	Fonseca	Carl	CS127	2014F	B

The keys for each relation are as follows:

- *Student*: name (all student names are assumed to be unique)
- *Course*: title and semester
- *Enrollment*: name, title, and semester

For each of the following, give the equivalent (a) TRC formula and (b) Datalog program:

1. Which students graduating in 2015 have ever gotten an A in CS127?
2. Which of Professor Doeppner's courses is Eliza taking this semester (2014F)?
3. $\sigma_{semester=2014F}(Courses) \bowtie Enrollment \bowtie \sigma_{gpa>3.5}(Student)$
4. $\pi_{name,title}(\sigma_{gradyear=2015}(Student) \bowtie Enrollment) \div \pi_{title}(\sigma_{semester=2014F,instructor=Doeppner}(Course) \bowtie Enrollment)$