CS127 Homework #1

Due: September 19th, 2018 6:00 P.M.

Handing In

Upload your homework to gradescope.
Please write your Banner ID on your submission. Do not write your name on the submission.

Grading Information

Grading for the homeworks works as follows:

- The set of warm-up problems will be graded as one of (✓ +, ✓, ✓ -)
- All other problems will be graded in detail and will be given a score.

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

Warmup #1

Given the following database schema:

driver(driver_id, car_id, driver_name, age)
car(car_id, model, year_produced)

Write a relational algebra expression for the following questions:

1. Find the driver ids of drivers older than 65
2. Find the driver ids of the drivers driving a "Fard" model car
3. Find the names of the drivers driving more than 5 cars with different ids

Warmup #2

Consider the following database schema for the universities around the world:

university(university_name, city, country)
student(student_id, student_name, university_name, year_of_attendance)

Given that:

- Every university has a unique name.
- Any given two students may have the same name.
- The students in different universities may have the same id, but not the students in the same university.

Identify the appropriate primary keys for the schemas above.
Problem 3 (To Be Graded)

Consider the following database schema for vegetables, people, and farmers:

- `person(id, first_name, last_name, city, age)`
- `farmer(id, work_city, income)`
- `vegetable(vegetable_name, color, origin_city)`
- `eats(id, vegetable_name)`
- `grows(id, vegetable_name)`

Given that:

- `id` of every farmer is included in `person` relation.
- Only farmers grow vegetables
- `eats` relation describes who likes to eat which vegetables. (Note: some people do not eat any vegetable)
- `grows` relation describes which farmer grows which vegetables. (Note: some farmers do not grow anything)

Write relational algebra expressions for the following queries:

1. Find the first and last names of farmers who are younger than 40 and do not live in the same city as the city where they work.
2. Find the ids of the farmers who grow vegetables that no one with first name Joe living in Providence likes to eat.
3. Without using aggregate functions, write a relational algebra expression to find the age of the youngest farmer.
4. Find the first and last names of the farmers who grow only green vegetables and at least 3 different vegetables.
5. Find the ids of the farmers who live in the same city as where they work and who only grow the vegetables that have the same origin city as the city they live in.

Problem 4 (To Be Graded)

Considering the schema given in Problem 4, state what the following relational algebra expression achieves.

\[ G_{\text{sum}}(\text{income})(\sigma_{\text{vegetable}_\text{name} = \text{null}}(\text{person} \bowtie \text{eats})) \bowtie \text{farmer} \]