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Lab 3: Relational Algebra

Part 1:

Your relations should be in the form of a table and should include the schema.

1. T1 $\bowtie_{T1.A=T2.A}$ T2

A	Q	R	B	C
20	a	5	b	6
20	a	5	b	5

2. T1 $\bowtie_{T1.Q=T2.B}$ T2

T1.A	Q	R	T2.A	B	C
25	b	8	20	b	6
25	b	8	20	b	5

3. T1 $\bowtie$T2

A	Q	R	B	C
20	a	5	b	6
20	a	5	c	3

4. T1 $\bowtie_{T1.A=T2.A \wedge T1.R=T2.C}$ T2

A	Q	R	B	C
20	a	5	b	5

Part 2:

1. Find the names of any player with an Elo rating of 2850 or higher.

$\pi_{Name}(\sigma Elo \geq 2850(Players))$

2. Find the names of any player who has ever played a game as white.

$\pi_{Name}(\sigma_{wpID=pID}(Players \bowtie Games))$

3. Find the names of any player who has ever won a game as white.

$\pi_{Name}(\sigma_{wpID=pID \wedge Result='1-0'}(Players \bowtie Games))$

4. Find the names of any player who played any games in 2018.

$\pi_{Name}(\sigma_{eID=gID}(Players \bowtie (\sigma_{Year=2018}(Events) \bowtie Games)))$

5. Find the names and dates of any event in which Magnus Carlsen lost a game.

$\pi_{Name,Year}(\sigma_{Result='0-1' \wedge (wpID=pID \vee bpID=pID) \wedge Name='MagnusCarlsen'}(Events \bowtie Games \bowtie Players))$

6. Find the names of all opponents of Magnus Carlsen. An opponent is someone who he has played a game against. **Hint:** Both Magnus and his opponents could play as white or black.

$\pi_{OpponentName}((\pi_{Name}(\sigma_{wpID=pID \wedge Name='MagnusCarlsen'}(Players)) \cup (\pi_{Name}(\sigma_{bpID=pID \wedge Name='MagnusCarlsen'}(Players)))) - \{'MagnusCarlsen'\})$

Part 3:

For these problems, assume that student names are unique.

Part 3.1:

a) Provide the relation that is the result of the following query. Your relation should be in the form of a table, and should include the schema.

- p (C, $\pi_{sid}(\sigma_{Grd=C}(Enrolled))$)
-$\pi_{Name}((\pi_{sid}(Enrolled\text{-}C) \bowtie Students)$

Name
Hermione
Harry

b) Provide a simple English description of what the query is searching for. Your description should be in general terms (remember that the original LMS instance data may change).

First part-
- Selecting sid from the Enrolled table where Grd is C.
- Projecting the sid of these selections.
- Creating a new relation p with columns C and the projected sid.

Second part-
- Subtracting relation C from Enrolled.
- Projecting the sid from this subtraction result.
- Performing a natural join with Students.
- Projecting the Name from the join result.

Looking for students enrolled in at least one course and did not receive a C.

Part 3.2:

a) Provide the relation that is the result of the following query. Your relation should be in the form of a table, and should include the schema.

-p(S1, Students)

-p(S2,Students)

- $\pi_{S2.Name}(\sigma_{S1.Name==Ron \wedge S1.DOB==S2.DOB \wedge S2.name!=Ron}(S1XS2)$

Name
Hermoine

b) Provide a simple English description of what the query is searching for. Your description should be in general terms (remember that the original LMS instance data may change).

It is pretty much looking for someone with the same DOB as ron but without ron. It creates 2 instances of the student table naming them S1 and S2. Then it selects rows of the cartesian product that S1.Name = ron S1.DOB is equal to S2.DOB and S2.Name !=Ron. Then projects the student(s) matching that condition.

Part 3.3:

a) Provide the relation that is the result of the following query. Your relation should be in the form of a table, and should include the schema.

$-\pi_{cName}((\pi_{cID,sID}(Enroll)/ \pi_{sID}(Students)) \bowtie Courses)$

Course_Name
SW Practice
Architecture
Databases

b) Provide a simple English description of what the query is searching for. Your description should be in general terms (remember that the original LMS instance data may change).

Projection on cID and sID from the Enroll relation
Division operation with projection on sID from Students
Join with Courses
Projection on cName
Looking for courses that every student is enrolled in.

Part 4:

$\pi_{Name}((\pi_{sID}(Enrolled)/\pi_{cID}(\sigma_{cID\geq 3000 \wedge cID<4000}(Courses))) \bowtie sIDStudents)$