COP 4710: Database Systems
Fall 2013

Chapter 4 – In Class Exercises (Part 2)

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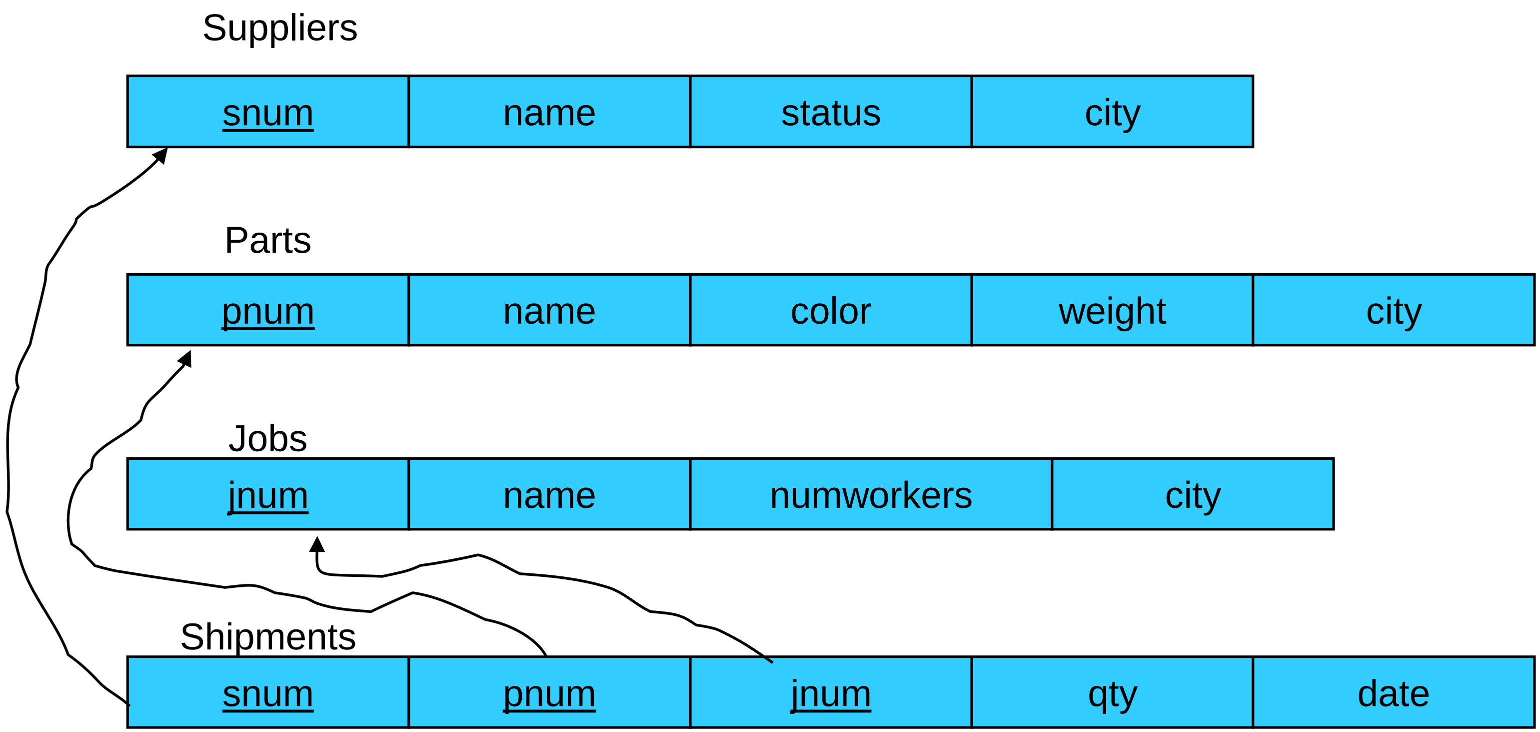
Chapter 4 In Class Exercises – Part 2

- Use the following database scheme for the problems in this exercise.



- Develop relational algebra query expressions, using any of the relational operators we've covered, for each of the following queries:

1. List only the names of those suppliers who ship every blue part. (Using only the five fundamental operators.)

<u>Solutions</u>

To shorten the expressions let:

S = Suppliers, P = Parts, SPJ = Shipments

Let $T = \pi_{(pnum)}\left(\sigma_{(color=blue)}(P)\right)$ // all blue parts

Let $U = \pi_{(snum,pnum)}(SPJ)$ // vertical restriction on shipments

Let $A = \{snum, pnum\}$ and $B = \{pnum\}$

$$result = \pi_{(A-B)}(U) - \left(\pi_{(A-B)}\left(\left(\pi_{(A-B)}(U) \times T\right) - U\right)\right)$$

– or –

$$result = \pi_{(snum)}(SPJ) - \left(\pi_{(snum)}\left(\left(\pi_{(snum)}(SPJ) \times \left(\pi_{(pnum)}\left(\sigma_{(color=blue)}(P)\right) - \left(\pi_{(snum,pnum)}(SPJ)\right)\right)\right)\right)\right)$$

$$final\ result = \pi_{(name)}\left(\sigma_{(S.snum=result.snum)}(S \times result)\right)$$

2. List only the names of those suppliers who ship every blue part. (Using the redundant division operator.)

$$\pi_{(name)}\left(S * \left(\left(\pi_{(snum,pnum)}(SPJ)\right) \div \left(\pi_{(pnum)}\left(\sigma_{(color=blue)}(P)\right)\right)\right)\right)$$

3. List every supplier number for those suppliers that ship both part P2 and part P3.

$$\pi_{(snum)}\left(\sigma_{(pnum='P2'\ AND\ pnum='P3')}(Shipments)\right)$$

What's wrong with this solution?????

A correct solution….

$$\left(\pi_{(snum)}\left(\sigma_{(pnum=P2)}(Shipments)\right)\right) \cap \pi_{(snum)}\left(\sigma_{(pnum=P3)}(Shipments)\right)$$

4. List the part numbers shipped by a supplier located in Orlando.

$$\pi_{(pnum)}\left(\left(\pi_{(snum)}\left(\sigma_{(city=Orlando)}\left(Suppliers\right)\right)\right) * Shipments\right)$$

5. List the part numbers shipped to every job.

$$\left(\pi_{p\#, j\#}\left(\text{SPJ}\right)\right) \div \left(\pi_{j\#}\left(\text{J}\right)\right)$$

6. List the part numbers shipped to every job in the same quantity.

$$\left(\pi_{p\#, quantity, j\#}\left(\text{SPJ}\right)\right) \div \left(\pi_{j\#}\left(\text{J}\right)\right)$$

7. List the supplier numbers for those suppliers who ship every part to any job.

$$\left(\pi_{snum,pnum}\left(SPJ\right)\right) \div \left(\pi_{pnum}\left(P\right)\right)$$

Why is this one wrong?

$$\left(\pi_{snum,pnum}\left(SPJ\right)\right) \div \left(\pi_{pnum}\left(SPJ\right)\right)$$

The query it answers is: list the supplier numbers for those suppliers who ship every part that is shipped to a job.

8. List the part numbers for those parts that are not shipped to any job.

$$\left(\pi_{p\#}\left(\mathrm{P}\right)\right) - \left(\pi_{p\#}\left(\mathrm{SPJ}\right)\right)$$

Tuple Calculus Practice

9. List the part numbers shipped by a supplier located in Orlando. (Same query as #4.)

$$\left\{ spjx.snum \,\middle|\, spjx \in S \text{ and } \exists sx\left(sx.city = \text{"Orlando" and } sx.snum = spjx.snum\right)\right\}$$

10. List the part numbers shipped to every job. (Same query as #5.)

$$\left\{ spjx.pnum \,\middle|\, spjx \in \text{SPJ and } \forall jx \in \text{J}\left(\exists \text{spjy} \in \text{SPJ } \left(spjy.jnum = jx.jnum \text{ and } spjy.pnum = spjx.pnum\right)\right)\right\}$$

or -

$$\left\{ spjx.pnum \,\middle|\, spjx \in \text{SPJ and not } \exists jx \in \text{J}\left(\text{not} \exists \text{spjy} \in \text{SPJ } \left(spjy.jnum \neq jx.jnum \text{ and } spjy.pnum \neq spjx.pnum\right)\right)\right\}$$