# COP 4710: Database Systems
# Fall 2012

## Chapter 4 – In Class Exercises (Part 2)


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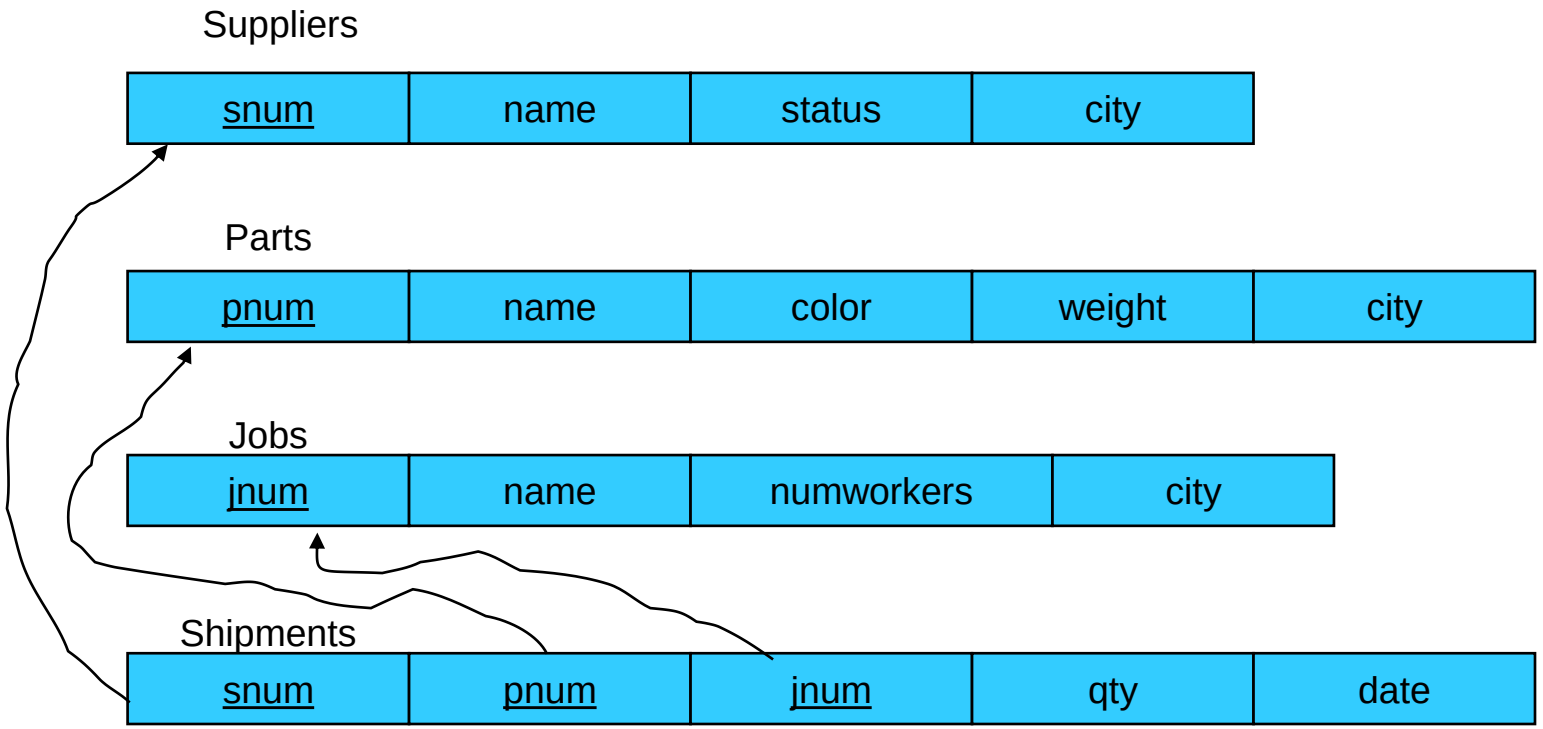
# Chapter 4 In Class Exercises – Part 2

- 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.)

Solutions

To shorten the expressions let:

S = Suppliers, P = Parts, SPJ = Shipments

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

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

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

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

– or –

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

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



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.

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

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

A correct solution….

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



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.

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

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

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



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.)

$$\{spjx.snum \mid spjx \in S \text{ and } \exists sx(sx.city = \text{"Orlando"} \text{ and } sx.snum = spjx.snum)\}$$

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

$$\{spjx.pnum \mid spjx \in \text{SPJ and } \forall jx \in \text{J}(\exists \text{spjy} \in \text{SPJ } (spjy.jnum = jx.jnum \text{ and } spjy.pnum = spjx.pnum))\}$$

or -

$$\{spjx.pnum \mid spjx \in \text{SPJ and not } \exists jx \in \text{J}(\text{not } \exists \text{spjy} \in \text{SPJ } (spjy.jnum \neq jx.jnum \text{ and } spjy.pnum \neq spjx.pnum))\}$$