COP 4710: Database Systems
Fall 2012

Chapter 4 – In Class Exercises (Part 1)

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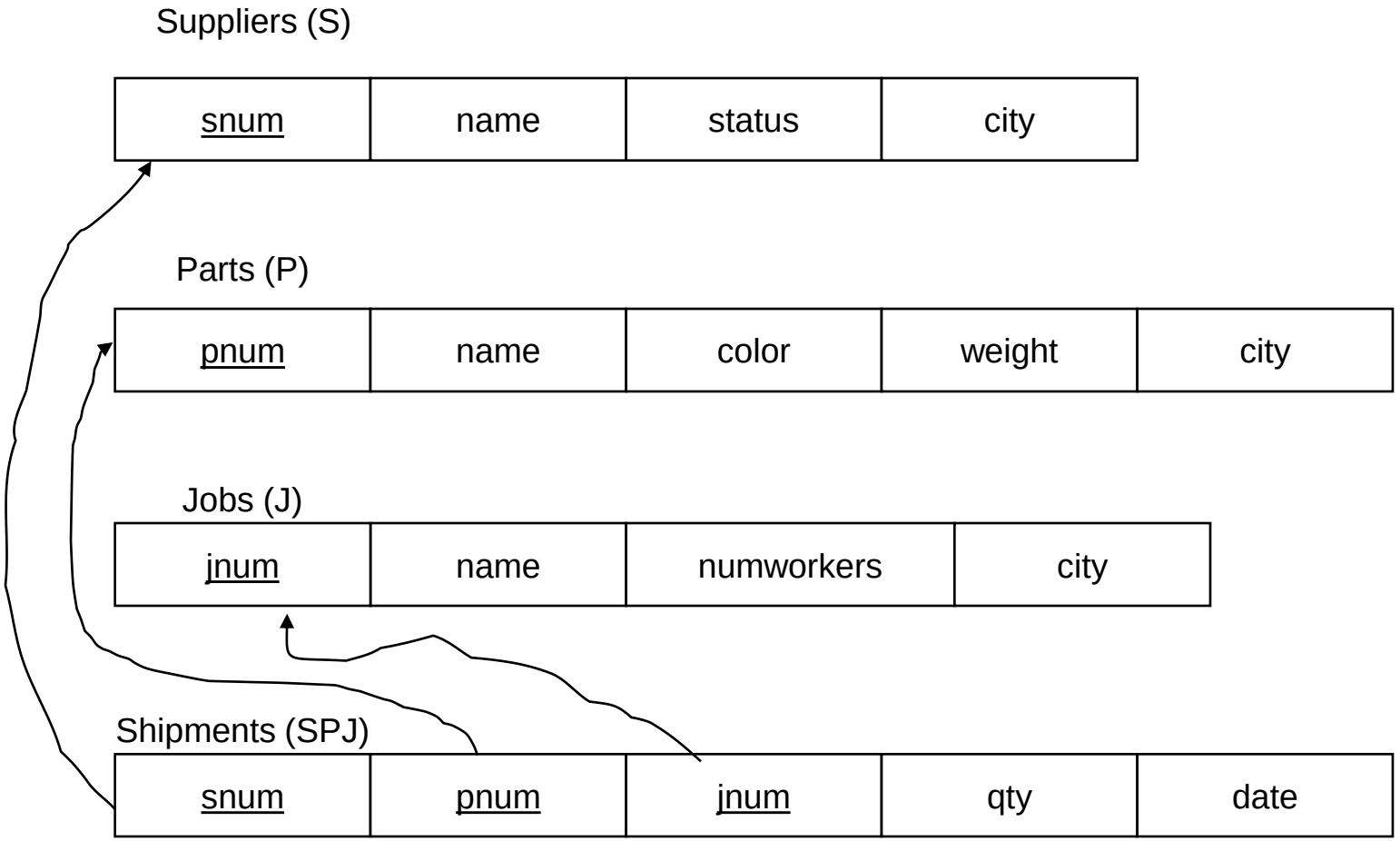
Chapter 4 In Class Exercises



- Use the database scheme on the previous page for the problems in this exercise.
- Develop relational algebra query expressions, using **only** the five fundamental operators, for each of the following queries:

1. List the parts that are either blue or weigh more than 20.

Solution#1: $\sigma_{(color="blue")\ OR\ (weight>20)}(Parts)$

Solution#2: $\sigma_{(color="blue")}(Parts) \cup \sigma_{(weight>20)}(Parts)$

2. List the parts that are blue and weigh more than 20.

Solution#1: $\sigma_{(color="blue")\ AND\ (weight>20)}(Parts)$

Solution#2: $\sigma_{(color="blue")}(Parts) \cap \sigma_{(weight>20)}(Parts)$

Why isn't the following solution correct?

$$\sigma_{(color="blue")}(Parts) \cup \sigma_{(weight>20)}(Parts)$$

3. List only the names of those parts that are not blue.

Solution#1: $\pi_{(name)}(\sigma_{(color \neq "blue")}(Parts))$

4. List the names of those suppliers who ship part number P3.

Solution#1: $\pi_{(name)}(\sigma_{(pnum="P3")}(Shipments \times Suppliers))$

Is solution #1 correct?

No, because the Cartesian product pairs all combinations from the two operand tables, even those combinations which are not related are generated by this operation.

A Correct Solution

$$\pi_{(name)}(\sigma_{(pnum="P3")\ AND\ (Shipments.snum=Suppliers.snum)}(Shipments \times Suppliers))$$

This condition (called an implicit join condition) eliminates from the Cartesian product unrelated tuples.

5. List only the names of those suppliers who ship a blue part.

Solutions

To shorten the expressions let:

S = Suppliers

P = Parts

SPJ = Shipments

$$\pi_{(\text{name})}\left(\sigma_{(\text{S.snum=SPJ.snum})}\left(S\times\left(\sigma_{(\text{P.pnum=SPJ.pnum})}\left(\left(\sigma_{(\text{color="blue"})}(P)\times SPJ\right)\right)\right)\right)\right)$$

$$\pi_{(\text{name})}\left(\sigma_{(\text{S.snum=SPJ.snum})}\left(S\times\left(\sigma_{(\text{color="blue"})\ \text{AND}\ (\text{P.pnum=SPJ.pnum})}\left(P\times SPJ\right)\right)\right)\right)$$

$$\pi_{(\text{name})}\left(\sigma_{(\text{S.snum=SPJ.snum})\ \text{AND}\ (\text{P.pnum=SPJ.pnum})\ \text{AND}\ (\text{color="blue"})}\left(S\times P\times SPJ\right)\right)$$

6. List the names of those jobs that do not receive a shipment of a blue part.

Solutions

To shorten the expressions let:

J = Jobs

P = Parts

SPJ = Shipments

$$\pi_{name}\left[J \times \left(\pi_{j\#}\left(\sigma_{SPJ.pnum=P.pnum}\left(SPJ \times \left(\pi_{p\#}\left(\sigma_{color \neq blue}\left(P\right)\right)\right)\right)\right)\right)\right]$$

Is this solution correct? NO!

A correct solution:

$$\pi_{name}\left(J \times \left[\begin{array}{l}\left(\pi_{j\#}\left(\sigma_{SPJ.pnum=P.pnum}\left(SPJ \times \left(\pi_{p\#}\left(\sigma_{color \neq blue}\left(P\right)\right)\right)\right)\right)\right) \\ -\left(\pi_{j\#}\left(\sigma_{SPJ.pnum=P.pnum}\left(SPJ \times \left(\pi_{p\#}\left(\sigma_{color = blue}\left(P\right)\right)\right)\right)\right)\right)\end{array}\right]\right)$$