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BS 20-05

Suppliers (sid: integer, sname: String, address: string)
Part (pid: integer, pname: string, color: string)
Catalog (sid: integer, pid: integer, cost: real)

1. find the name of suppliers who supply some red part.

$$\pi_{sname} (\pi_{sid} ((\pi_{pid} \sigma_{color = 'red'} Parts) \bowtie Catalog) \bowtie Suppliers)$$

2. find the sids of suppliers who supply some red or green part.

$$\pi_{sid} (\pi_{pid} (\sigma_{color = 'red' \vee color = 'green'} Parts) \bowtie Catalog)$$

3. find the sids of suppliers who supply some red part or are at 221 Packer Street.

$$\rho (R_1, \pi_{sid} ((\pi_{pid} \sigma_{color = 'red'} Parts) \bowtie Catalog))$$
$$\rho (R_2, \pi_{sid} \sigma_{address = '221 Packer Street'} Suppliers)$$
$$R_1 \cup R_2$$

4. find the sids of suppliers who supply some red part and some green part.

$$\rho (R_1, \pi_{sid} ((\pi_{pid} \sigma_{color = 'red'} Parts) \bowtie Catalog))$$
$$\rho (R_2, \pi_{sid} ((\pi_{pid} \sigma_{color = 'green'} Parts) \bowtie Catalog))$$
$$R_1 \cap R_2$$

5. find the sids of suppliers who supply every part

$$(\pi_{sid, pid} Catalog) / (\pi_{pid} Parts)$$

6. find the sids of suppliers who supply every red part

$$(\pi_{sid, pid} Catalog) / (\pi_{pid} \sigma_{color = 'red'} Parts)$$

7. find the sids of suppliers who supply every red part or green part.

$$(\pi_{sid, pid} Catalog) / (\pi_{pid} \sigma_{color = 'red' \vee color = 'green'} Parts)$$

8. find the sids of suppliers who supply every red part or supply every green part

$$\rho (R_1, ((\pi_{sid, pid} Catalog) / (\pi_{pid} \sigma_{color = 'red'} Parts)))$$
$$\rho (R_2, ((\pi_{sid, pid} Catalog) / (\pi_{pid} \sigma_{color = 'green'} Parts)))$$
$$R_1 \cup R_2$$

9. find pairs of sids such that the supplier with the first sid charges more for some part than the supplier with the second sid.

$$\rho (R_1, Catalog)$$
$$\rho (R_2, Catalog)$$
$$\pi_{R_1.sid, R_2.sid} (\sigma_{R_1.pid = R_2.pid \wedge R_1.sid \neq R_2.sid \wedge R_1.cost > R_2.cost} (R_1 \times R_2))$$

10. find the pids of parts supplied by at least two different suppliers.

$$\rho (R_1, Catalog)$$
$$\rho (R_2, Catalog)$$
$$\pi_{R_1.pid} \sigma_{R_1.pid = R_2.pid \wedge R_1.sid \neq R_2.sid} (R_1 \times R_2)$$