1. $\Pi_{PNAME}(PARTS * CATALOG)$

2. $T_1 \leftarrow PARTS * CATALOG$
   $T_2 \leftarrow \sigma_{STREET = '1 Central Ave'}(SUPPLIERS)$
   $T_3 \leftarrow \Pi_{PNAME}(T_1 * T_2)$

3. $T_1 \leftarrow PARTS * CATALOG * SUPPLIERS$
   $T_2 \leftarrow \Pi_{SNAME}(\sigma_{COLOR = 'red'}(T_1))$

4. $T_1 \leftarrow \sigma_{COLOR = 'red' \text{ OR } COLOR = 'GREEN'}(PARTS)$
   $T_2 \leftarrow \Pi_{SID}(CATALOG * T_1)$

5. $T_1 \leftarrow \sigma_{COLOR = 'red'}(PARTS)$
   $T_2 \leftarrow \sigma_{STREET = '221 packer street'}(SUPPLIERS)$
   $T_3 \leftarrow T_1 * CATALOG$
   $T_4 \leftarrow (\Pi_{SID}(T_2)) \cup (\Pi_{SID}(T_3))$

6. $T_1 \leftarrow CATALOG * (\sigma_{COLOR = 'red'}(PARTS))$
   $T_2 \leftarrow CATALOG * (\sigma_{COLOR = 'green'}(PARTS))$
   $T_3 \leftarrow (\Pi_{SID}(T_1)) \cap (\Pi_{SID}(T_2))$

7. $T_1 \leftarrow \sigma_{COLOR = 'red'}(PARTS)$
   $T_2 \leftarrow \sigma_{CITY = 'Newark'}(SUPPLIERS) * CATALOG$
   $T_3 \leftarrow (\Pi_{PID}(T_1)) \cup (\Pi_{PID}(T_2))$

8. $T_1 \leftarrow (\sigma_{CITY = 'Newark'}(SUPPLIERS)) * CATALOG$

$T_2 \leftarrow (\sigma_{CITY = 'Trenton'}(SUPPLIERS)) * CATALOG$

$T_3 \leftarrow (\Pi_{PID}(T_1)) \cap (\Pi_{PID}(T_2))$

9. $T_1 \leftarrow \Pi_{SID}(SUPPLIERS)$

$T_2 \leftarrow \Pi_{SID, PID}(CATALOG)$

$T_3 \leftarrow T_2 \div T_1$

10. $T_1 \leftarrow \Pi_{SID}(CATALOG)$

$T_2 \leftarrow \Pi_{SID, PID}(CATALOG)$

$T_3 \leftarrow T_2 \div T_1$

11. $T_1 \leftarrow \Pi_{SID}(\sigma_{CITY = 'Newark' \text{ OR } CITY = 'Trenton'}(SUPPLIERS))$

$T_2 \leftarrow \Pi_{SID, PID}(CATALOG)$

$T_3 \leftarrow T_2 \div T_1$

12. $T_1 \leftarrow \Pi_{SID, PID}(CATALOG) \div \Pi_{SID}(\sigma_{CITY = 'Newark'}(SUPPLIERS))$

$T_2 \leftarrow \Pi_{SID, PID}(CATALOG) \div \Pi_{SID}(\sigma_{CITY = 'Trenton'}(SUPPLIERS))$

$T_3 \leftarrow T_1 \cup T_2$

13. 11 is more restrictive. Because in 11, the parts are supplied by the suppliers from newark and (both)

by the supplier from Trenton. In the 12, the parts only need to supplied by one of these two cities.

14. $T_1 \leftarrow (\rho_{PID \to PIDS,\ COST \to COSTS}(CATALOG)) * CATALOG$

$T_2 \leftarrow \Pi_{PID, PIDS}(\sigma_{COST > COSTS}(T_1))$

15. $T_1 \leftarrow \Pi_{SID, PID}(CATALOG)$

$T_2 \leftarrow \rho_{PID \to PIDS}(T_1)$

$T_3 \leftarrow \sigma_{PID \neq PIDS}(T_1 * T_2)$

$T_4 \leftarrow \Pi_{SID}(T_3)$

16. $T_1 \leftarrow {}_{SID}\tilde{\mathcal{F}}_{COUNT(PID)}(CATALOG)$

$T_2 \leftarrow \Pi_{SID}(\sigma_{count(PID) \geq 2}(T_1))$

17. $T_1 \leftarrow {}_{PID}\tilde{\mathcal{F}}_{MAX(COST)}(CATALOG)$

$T_2 \leftarrow \rho_{MAX(COST) \to COST}(T_1)$

$T_3 \leftarrow \Pi_{SID, PID}(CATALOG * T_2)$

$T_4 \leftarrow SUPPLIERS * T_3$

$T_5 \leftarrow \sigma_{CITY = 'Newark'}(T_4)$

$T_6 \leftarrow \Pi_{PID, SID, SName}(T_5)$

18. $T_1 \leftarrow {}_{PID}\tilde{\mathcal{F}}_{count(SID)}(CATALOG)$

$T_2 \leftarrow \Pi_{PID, pname}(PARTS)$

$T_3 \leftarrow T_2 * T_1$

19. $T_1 \leftarrow {}_{PID}\tilde{\mathcal{F}}_{Average(COST)}(CATALOG)$

$T_2 \leftarrow \Pi_{PID, pname}(PARTS)$

$T_3 \leftarrow T_2 * T_1$

20. $T_1 \leftarrow \sigma_{COLOR = 'red'}(PARTS)$

$T_2 \leftarrow T_1 * CATALOG$

$T_3 \leftarrow \mathcal{F}_{average(COST)}(T_2)$

21. $T_1 \leftarrow \sigma_{sname = 'Yosemite\ Sham'}(SUPPLIERS)$

$T_2 \leftarrow T_1 * CATALOG$

$T_3 \leftarrow \mathcal{F}_{average(COST)}(T_2)$