Student Name: _____

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In-class Exercise 04 SQL 1

Consider the following schema:

(S)
Suppliers(*sid*: integer, *sname*: string, *address*: string)
(P) Parts(*pid*: integer, *pname*: string, *color*: string)
(C) Catalog(*sid*: integer, *pid*: integer, *cost*: real)

The key fields are underlined, and the domain of each field is listed after the field name. Therefore *sid* is the key for Suppliers, *pid* is the key for Parts, and *sid* and *pid* together form the key for Catalog.

Parts
↑

Query 1: Find the *names* of suppliers who supply some **red** part.

Join - Selection - Projection query

Solution:

RA: ρ(S, Suppliers), ρ(P, Parts), ρ(C, Catalog)

$$\Pi_{S.sname}\left(\sigma_{P.color='red',\ S.sid=C.sid,\ P.cid=C.pid}(S \times P \times C)\right)$$

SQL:

```
SELECT S.sname
FROM   Suppliers AS S, Parts AS P, Catalog AS C
WHERE  P.color='red' AND S.sid=C.sid AND P.cid=C.cid
```

Catalog ← Parts
↑

Query 2: Find the *sids* of suppliers who supply some **red** or **green** part.

① Determine the restriction in the description

② Search if there exist the same attributes as the ones in other entities

③ If yes, just find that entity and determine if there exists the target attribute in that entity.

Solution:

RA: $\rho(C, \text{Catalog}), \rho(P, \text{Parts})$

$\pi_{C.sid}(\sigma_{(P.color='red' \vee P.color='green'),\ P.pid=C.pid}(C \times P))$

SQL:

```
SELECT C.sid AS        AS
FROM   Catalog C, Parts P
WHERE  (P.color='red' OR P.color='green') AND P.pid=C.pid
```

Query 3: Find the *sids* of suppliers who supply some **red** part or are at '**221 Packer Street**'

no need to use EXISTS operation

Solution:

RA: $\rho(S, \text{Suppliers}), \rho(P, \text{Parts}), \rho(C, \text{Catalog})$

$\rho(R_1, \pi_{S.sid}(\sigma_{S.address='221\ Packer\ Street'}(S)))$

$\rho(R_2, \pi_{S.sid}(\sigma_{P.color='red',\ P.pid=C.pid,\ C.sid=S.sid}(P \times C)))$

$R_1 \cup R_2$

SQL:

```
SELECT S.sid
FROM   Suppliers AS S
WHERE  S.address='221 Packer Street' OR
       S.sid IN (SELECT C.sid FROM
                 Parts AS P, Catalog AS C
                 WHERE P.pid=C.pid AND P.color='red')
```

We need to use EXISTS operation to test if the set is empty. If yes, the query is invalid

Query 4: Find the *sids* of suppliers who supply some **red** part and some **green** part.

Solution:

RA: $P(P, parts),\ P(C, Catalog)$

$P(R_1, \Pi_{c.sid}(\sigma_{p.color='red',\ p.pid=c.pid}(P \times C)))$

$P(R_2, \Pi_{c.sid}(\sigma_{p.color='green',\ p.pid=c.pid}(P \times C)))$

$R_1 \cap R_2$

SQL:
```
SELECT C.sid
FROM   Catalog AS C, Parts AS P
WHERE  (P.color='red' AND P.pid=C.pid)
       AND EXISTS( SELECT C2.sid FROM Catalog AS C2, Parts AS P2
                   WHERE P2.color='green' AND P2.pid=C2.pid )
```

Query 5: Find the *sids* of suppliers who supply every **red** part.

division

red part

Solution:

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

not exists any red part that is not supplied by suppliers

NOT EXISTS(P-C)

P.color='red'

SQL:
```
SELECT C.sid
FROM Catalog AS C
WHERE NOT EXISTS((SELECT P.pid FROM Parts AS P WHERE P.color='red')
                 EXCEPT
                 (SELECT C1.pid FROM Catalog AS C1 WHERE C1.sid=C.sid))
```

```
WHERE S2.sname='Tom' AND S2.sid= C2.pid)
```

in "Catalog"

Query 6: Find the *pids* of the most expensive parts supplied by suppliers named 'Tom'. Please write down the SQL query.

possibly many 'Tom's

Solution:
```
SELECT C.pid
FROM Catalog AS C, Suppliers AS S
WHERE S.sname='Tom' AND S.sid=C.sid
      AND C.cost >= (SELECT C2.cost
                     FROM Catalog AS C2, Suppliers AS S2
```

Query 7: Find the average cost of all the red parts. Please write down the SQL query.

Solution:

```
SELECT AVG(C.cost)
FROM Catalog C, Parts P
WHERE P.color='red' AND C.pid=P.pid
```

Query 8: Find the average cost of each part according to the color (including the same part supplied by different suppliers). Please write down the SQL query.

Solution:

```
SELECT AVG(C.cost), P.color
FROM Catalog C, Parts P
WHERE C.pid=P.pid
GROUP BY P.color
```

→ since we need 'GROUP BY' clause involving p.color, we need to select p.color first.

division

Query 9: Find the pids of red parts supplied by every supplier. Please write down the SQL query.

not exists any suppliers who don't supply red parts (Pid)
⇒ NOT EXISTS(S − C)

Solution:

```
SELECT P.pid
FROM Parts AS P
WHERE NOT EXISTS(SELECT S.sid
                 FROM suppliers AS S
                 EXCEPT
                 SELECT C.sid
                 FROM Catalog AS C
                 WHERE C.pid = P.pid)
  AND P.color = 'red'
```

Query 10: Find the average cost of each part which is supplied by at least two suppliers, and we only consider the parts with red or green color. Please write down the SQL query.

Solution:

```
SELECT AVG(C.cost), C.pid
FROM catalog C, parts P
WHERE C.pid = P.pid
AND (P.color = 'green' OR P.color = 'red')
GROUP BY C.pid
HAVING COUNT(*) > 1
```