PRACTICING SQL

DISCUSSION SESSION 7, SECTION A
SQL EXERCISE 1

Consider the following (simplified) database schema

```
Suppliers( sid, sname, address )
Parts( pid, pname, color )
Catalog( sid, pid, cost )
```

with these relation (example) instances

<table>
<thead>
<tr>
<th>Suppliers</th>
<th>Parts</th>
<th>Catalog</th>
</tr>
</thead>
<tbody>
<tr>
<td>sid</td>
<td>sname</td>
<td>address</td>
</tr>
<tr>
<td>1</td>
<td>Supplier1</td>
<td>Add1</td>
</tr>
<tr>
<td>2</td>
<td>Supplier2</td>
<td>Add2</td>
</tr>
<tr>
<td>3</td>
<td>Supplier3</td>
<td>Add3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. Find the \textit{pnames} of parts for which there is some supplier.

SELECT DISTINCT pname
FROM Parts
WHERE pid IN ( SELECT pid
    FROM Catalog
);

SELECT DISTINCT pname
FROM Parts NATURAL JOIN Catalog;

SELECT DISTINCT pname
FROM Parts, Catalog
WHERE Parts.pid = Catalog.pid;
SQL EXERCISE 1

2. Find the sname of suppliers who supply every red part.

```sql
SELECT DISTINCT S.sname
FROM Suppliers S
WHERE NOT EXISTS
  ( SELECT P.pid
    FROM Parts P
    WHERE P.color = 'red'
  )
EXCEPT
  ( SELECT C.pid
    FROM Catalog C
    WHERE C.sid = S.sid
  );
```

Why not DISTINCT?

How would you do this query without EXCEPT?
SQL EXERCISE 1

3. Find the \textit{pnames} of parts supplied by “Supplier2” and no one else.

\begin{verbatim}
SELECT DISTINCT P.pname
FROM Parts P
WHERE P.pid IN ( SELECT DISTINCT C.pid
    FROM Suppliers S NATURAL JOIN Catalog C
    WHERE S.sname = 'Supplier2'
    AND C.pid NOT IN ( SELECT DISTINCT C2.pid
        FROM Suppliers S2
        NATURAL JOIN Catalog C2
        WHERE S2.sname <> 'Supplier2'
    )
);
\end{verbatim}

How can you express this query with \texttt{EXCEPT}?
SQL EXERCISE 1

4. For each part, find the `sname` of the supplier who charges the most for that part.

```
SELECT R.pid, S.sname
FROM Suppliers S
NATURAL JOIN (SELECT C.sid, C.pid
              FROM Catalog C
              WHERE C.cost = (SELECT MAX(C2.cost)
                              FROM Catalog C2
                              WHERE C.pid = C2.pid)
              ) R;
```
5. Find the sids of suppliers who supply exactly one red part.

SELECT C.sid
FROM Catalog C NATURAL JOIN Parts P
WHERE P.color = 'red'
GROUP BY C.sid
HAVING COUNT(*) = 1;

SELECT R.sid
FROM ( SELECT C.sid, COUNT( C.pid ) AS numRedParts
FROM Catalog C NATURAL JOIN Parts P
WHERE P.color = 'red'
GROUP BY C.sid
) R
WHERE R.numRedParts = 1
6. Find the sids of suppliers who supply at least 2 parts with distinct costs.

```
SELECT sid
FROM Catalog
GROUP BY sid
HAVING COUNT(DISTINCT cost) > 1;
```
SQL EXERCISE 2

Consider the following (simplified) database schema

\[
\text{Aircraft}(\ aid, \ aname, \ cruisingrange )
\]
\[
\text{Employees}(\ eid, \ ename, \ salary )
\]
\[
\text{Certified}(\ eid, \ aid )
\]

where a pilot is an employee certified for flying at least an aircraft.

<table>
<thead>
<tr>
<th>Aircraft</th>
<th>Employees</th>
<th>Certified</th>
</tr>
</thead>
<tbody>
<tr>
<td>aid  aname cruisingrange</td>
<td>eid ename salary</td>
<td>eid aid</td>
</tr>
<tr>
<td>a1   Aircraft1 4000</td>
<td>e1 Employee1 100000</td>
<td>e1 a1</td>
</tr>
<tr>
<td>a2   Aircraft2 2000</td>
<td>e2 Employee2 90000</td>
<td>e2 a1</td>
</tr>
<tr>
<td>a3   Aircraft3 5000</td>
<td>e3 Employee3 10000</td>
<td>e1 a2</td>
</tr>
<tr>
<td></td>
<td>e4 Employee4 5000</td>
<td>e3 a2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>e1 a3</td>
</tr>
</tbody>
</table>
SQL EXERCISE 2

1. Find the anames of aircrafts such that all pilots certified to operate them earn more than $80,000.

```
SELECT DISTINCT A.aname
FROM Aircraft A
    NATURAL JOIN ( SELECT C.aid, MIN( E.salary ) AS minSalary
                    FROM Certified C NATURAL JOIN Employees E
                    GROUP BY C.aid
                ) R
WHERE R.minSalary > 80000;
```

How can you express this query with HAVING?
SQL EXERCISE 2

2. For each pilot who is certified for more than 2 aircrafts, find the \textit{eid} and the maximum \textit{cruisingrange} of the aircraft for which he/she is certified.

```
SELECT R.eid, MAX(A.cruisingrange) AS maxCR
FROM Aircraft A
NATURAL JOIN Certified C2
NATURAL JOIN (SELECT C.eid
                FROM Certified C
                GROUP BY C.eid
                HAVING COUNT(*) > 2
            ) R
GROUP BY R.eid;
```
3. Compute the difference between the average salary of a pilot and the average salary of all employees (including pilots).

```sql
SELECT ( SELECT AVG(E.salary) FROM Employees E WHERE E.eid IN ( SELECT C.eid FROM Certified C ) ) - ( SELECT AVG(E2.salary) FROM Employees E2 ) AS difference;
```
QUESTIONS?