3a. Structured Query Language Exercises
Let $R(A,B,C)$ and $S(D,E,F)$ be two union compatible relation schemas. Convert the following algebra expressions to SQL (for simplicity, you can omit DISTINCT):

1. $\pi_A R$
   
   SELECT A, FROM R

2. $\sigma_{C=12} R$
   
   SELECT *, FROM R
   WHERE C=12

3. $\pi_{A,F} (R \ JOIN_{C=D} S)$
   
   SELECT A,F
   FROM R, S
   WHERE C=D

4. $\pi_A R \setminus \pi_D S$
   
   SELECT A, FROM R
   EXCEPT
   SELECT D FROM S
**Example Database**

**Sailors** \((\text{sid}, \text{sname})\),

**Reserves** \((\text{sid}, \text{bid}, \text{date})\),

**Boats** \((\text{bid}, \text{bname}, \text{color})\)

### Sailors

<table>
<thead>
<tr>
<th>sid</th>
<th>sname</th>
<th>rating</th>
<th>age</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>dustin</td>
<td>7</td>
<td>45.0</td>
</tr>
<tr>
<td>31</td>
<td>lubber</td>
<td>8</td>
<td>55.5</td>
</tr>
<tr>
<td>58</td>
<td>rusty</td>
<td>10</td>
<td>35.0</td>
</tr>
</tbody>
</table>

### Reserves

<table>
<thead>
<tr>
<th>sid</th>
<th>bid</th>
<th>day</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>101</td>
<td>10/10/96</td>
</tr>
<tr>
<td>58</td>
<td>103</td>
<td>11/12/96</td>
</tr>
</tbody>
</table>
Find the names of sailors who reserved bid=103

SELECT S.sname
FROM Sailors as S, Reserves as R
WHERE S.sid=R.sid AND R.bid=103

<table>
<thead>
<tr>
<th>(sid)</th>
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<th>age</th>
<th>(sid)</th>
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</tr>
</tbody>
</table>
Find sid’s of sailors who’ve reserved a red or a green boat

SELECT  R.sid
FROM  Boats as B, Reserves as R
WHERE  R.bid=B.bid
      AND (B.color='red' OR B.color='green')

Alternative

SELECT  R.sid
FROM  Boats as B, Reserves as R
WHERE  R.bid=B.bid
      AND B.color='red'
UNION
SELECT  R.sid
FROM  Boats as B, Reserves as R
WHERE  R.bid=B.bid
      AND B.color='green'

• If we replace OR by AND in the first version, what do we get?

• What do we get if we replace UNION by EXCEPT in the second version?
Find sid’s of sailors who’ve reserved a red and a green boat

SELECT  S.sid
FROM  Sailors as S, Boats as B1, Reserves as R1,
     Boats as B2, Reserves as R2
WHERE  S.sid=R1.sid AND R1.bid=B1.bid
       AND B1.color=‘red’ AND S.sid=R2.sid

SELECT  S.sid
FROM  Sailors as S, Boats as B, Reserves as R
       AND B.color=‘red’
INTERSECT
SELECT  S.sid
FROM  Sailors as S, Boats as B, Reserves as R
       AND B.color=‘green’

- What if instead of the sid we want the sname? Would the queries be correct if we replace SELECT S.sid with S.sname?