CSC343 Worksheet 3 Solution

June 16, 2020

1. **Exercise 6.1.1**:

   If there is a comma between A and B (i.e, *SELECT A, B*), we can conclude A and B are two different attributes.

   If there are no commas between A and B, we can conclude B is an alias of A.

2. **Exercise 6.1.2**:

   a) SELECT address FROM Studio WHERE name = 'MGM';

   b) SELECT birthdate FROM MovieStar WHERE name = 'Sandra Bullock';

   c) SELECT starName FROM StarsIn WHERE movieYear = 1980, movieTitle LIKE '%Love%';

   Correct Solution:

   SELECT starName FROM StarsIn WHERE movieYear = 1980 AND movieTitle LIKE '%Love%';

   d) SELECT name FROM MovieExec WHERE netWorth >= 10000000;

   e) SELECT name FROM MovieStar WHERE gender='male' OR address LIKE '%Malibu%';

3. **Exercise 6.1.3**:

   a) SELECT model, speed, hd FROM PC WHERE price < 1000;

   b) SELECT model, speed AS gigahertz, hd AS gigabytes FROM PC WHERE price < 1000;

   c) SELECT maker FROM Product WHERE type='printer';

   d) SELECT model, ram, screen FROM Laptops WHERE price > 1500;

   e) SELECT * FROM Printer WHERE color=TRUE;

f) SELECT model, hd FROM PC WHERE speed = 3.20 AND price < 2000;

4. **Exercise 6.1.4**:

a) SELECT class, country FROM Classes where numGuns >= 10;

b) SELECT name AS shipName FROM Ships WHERE launched < 1918;

c) SELECT ship, battle FROM Outcomes WHERE result='sunk';

d) SELECT name FROM Ships WHERE name = class;

e) SELECT name FROM Ships WHERE name LIKE 'R%';

f) SELECT name FROM ships WHERE name LIKE '% % %';

5. **Exercise 6.1.5**:

a) Given $a = 10$, the sets of tuples that satisfy the condition is

$(10, -MAX\_INT), (10, -MAX\_INT + 1), \cdots (10, 0), \cdots, (10, MAX\_INT - 1),$
$(10, MAX\_INT), (10, NULL)$

Given $b = 20$, the sets of tuples that satisfy the condition is

$(-MAX\_INT, 20), (-MAX\_INT + 1, 20), \cdots (0, 20), \cdots, (MAX\_INT - 1, 20),$
$(MAX\_INT, 20), (NULL, 20)$

Given $a = 10$ and $b = 20$, the set of tuple that satisfy the condition is $(10, 20)$

b) Given $a = 10$ AND $b = 20$, the only set of (a, b) tuple that satisfy the condition is $(10, 20)$.

c) There are three cases to consider

i. $a < 10$

In this case, the set of (a, b) tuples that satisfy the condition is:

$(9, -MAX\_INT), (9, -MAX\_INT + 1), \cdots (9, 0), \cdots, (9, MAX\_INT - 1),$
$(9, MAX\_INT), (9, NULL)$

$(8, -MAX\_INT), (8, -MAX\_INT + 1), \cdots (8, 0), \cdots, (8, MAX\_INT - 1),$
$(8, MAX\_INT), (8, NULL)$

$\cdots$

$(-MAX\_INT + 1, -MAX\_INT), (-MAX\_INT + 1, -MAX\_INT + 1),$
$\cdots (-MAX\_INT + 1, 0), \cdots, (-MAX\_INT + 1, MAX\_INT - 1),$
$(-MAX\_INT + 1, MAX\_INT), (-MAX\_INT + 1, NULL)$

$(-MAX\_INT + 1, -MAX\_INT), (-MAX\_INT + 1, -MAX\_INT + 1),$
$\cdots (-MAX\_INT + 1, 0), \cdots, (-MAX\_INT + 1, MAX\_INT - 1),$
$(-MAX\_INT + 1, MAX\_INT), (-MAX\_INT + 1, NULL)$

ii. $a >= 10$

In this case, the set of (a, b) tuples that satisfy the condition is:

$(10, -MAX\_INT), (10, -MAX\_INT + 1), \cdots (10, 0), \cdots, (10, MAX\_INT - 1),$
$(10, MAX\_INT), (10, NULL)$

$(11, -MAX\_INT), (11, -MAX\_INT + 1), \cdots (11, 0), \cdots, (11, MAX\_INT - 1),$
$(11, MAX\_INT), (11, NULL)$

$\cdots$

$(MAX\_INT - 1, -MAX\_INT), (MAX\_INT - 1, -MAX\_INT + 1),$
$\cdots (MAX\_INT - 1, 0), \cdots, (MAX\_INT - 1, MAX\_INT - 1),$
$(MAX\_INT - 1, MAX\_INT), (MAX\_INT - 1, NULL)$

$(MAX\_INT, -MAX\_INT), (MAX\_INT, -MAX\_INT + 1),$
$\cdots (MAX\_INT, 0), \cdots, (MAX\_INT, MAX\_INT - 1),$
$(MAX\_INT, MAX\_INT), (MAX\_INT, NULL)$

iii. $a < 10$ AND $a >= 10$

This case is not considered. No (a, b) tuples match this condition.

d) In this case the set of (a, b) tuples that satisfy this condition is

$(-MAX\_INT, -MAX\_INT), (-MAX\_INT + 1, -MAX\_INT + 1),$
$\cdots (0, 0), \cdots, (MAX\_INT - 1, MAX\_INT - 1),$
(MAX_INT, MAX_INT)

Here, the case $a = NULL$ and $b = NULL$ is not considered, since $NULL \neq NULL$.

Notes:

- NULL = NULL is NULL.

e) In this case, the set of (a, b) tuples that satisfy this condition is

$(-MAX\_INT, -MAX\_INT), (-MAX\_INT, -MAX\_INT + 1),$
$\cdots, (-MAX\_INT, MAX\_INT - 1),$
$(-MAX\_INT, MAX\_INT),$

$(-MAX\_INT + 1, -MAX\_INT + 1), (-MAX\_INT + 1, -MAX\_INT + 2),$
$\cdots, (-MAX\_INT + 1, MAX\_INT - 1),$
$(-MAX\_INT + 1, MAX\_INT),$

$\cdots$

$(MAX\_INT - 1, MAX\_INT - 1), (MAX\_INT - 1, MAX\_INT)$,

(MAX_INT, MAX_INT)

Here, the case $a = NULL$ OR $b = NULL$ is not considered, since $a \not\leq b$.

6. SELECT * FROM Movies WHERE length;

7. (a) SELECT StarsIn.starName FROM StarsIn, MovieStar WHERE StarsIn.starName = MovieStar.name AND MovieStar.gender = 'male';
   (b) SELECT StarsIn.starName FROM Movies, StarsIn WHERE StarsIn.movieTitle = Movies.title AND Movies.studioName = 'MGM';
   (c) SELECT MovieExec.name FROM MovieExec, Studio WHERE MovieExec cert# = studio.presC# AND Studio.name = 'MGM';
   (d) SELECT M2.title FROM Movies AS M1, Movies AS M2 WHERE M1.title = "Gone With the Wind" AND M2.length > M1.length;
   (e) SELECT Mx2.name FROM MovieExec AS Mx1, MovieExec AS Mx2 WHERE Mx1.name = 'Merg Griffin' AND Mx2.netWorth > Mx1.netWorth;

8. a) SELECT Product.maker, Laptop.speed FROM Product, Laptops WHERE Product.type = 'laptop' AND Laptop.hd >= 30;
   b) (SELECT model, price FROM PC INNER JOIN Product ON PC.model = Product.model WHERE maker = 'B')

      UNION

      (SELECT model, price FROM Printer INNER JOIN Product ON Printer.model = Product.model WHERE maker = 'B')

      UNION

      (SELECT model, price FROM Laptop INNER JOIN Product ON Laptop.model = Product.model WHERE maker = 'B')

   c) (SELECT maker FROM Product WHERE type='laptop') - (SELECT maker FROM Product WHERE type='pc')
   d) SELECT pc1.hd FROM PC AS pc1, PC AS pc2 WHERE pc1.model ! = pc2.model AND pc1.hd = pc2.hd;
   e) SELECT pc1.model FROM PC AS pc1, PC AS pc2 WHERE pc2.model ! = pc1.model AND pc2.model >= pc1.model AND pc2.ram = pc1.ram AND pc2.speed = pc1.speed;

9. The second part of problem (i.e. Writing each query in different ways) will be done during review :).

a)
```
SELECT maker FROM Product WHERE model IN (
    SELECT model FROM PC WHERE product.model = PC.model AND
    PC.speed >= 3.0
);
```

b)
```
SELECT p1.model FROM Printer AS p1 WHERE
p1.price >= ALL (
    SELECT p2.price FROM Printer AS p2
)
```

c)
```
SELECT l1.model FROM Laptop AS l1 WHERE
speed >= ALL (
    SELECT l2.speed FROM Laptop AS l2
)
```

Correct Solution:
```
 SELECT l1.model FROM Laptop AS l1 WHERE
 speed <= ALL (                          //correction: >=
changed to <=
     SELECT l2.speed FROM Laptop AS l2
 )
```

d)
```
SELECT model FROM (
    (SELECT model, price FROM PC)
    UNION
    (SELECT model, price FROM Laptop)
    UNION
    (SELECT model, price FROM Printer)
) AS ModelPrice WHERE price >= ANY (
    SELECT price FROM ModelPrice
)
```

e)
```
SELECT model FROM (
    (SELECT model, price FROM PC)
    UNION
    (SELECT model, price FROM Laptop)
    UNION
    (SELECT model, price FROM Printer)
) AS ModelPrice WHERE price >= ANY (
    SELECT price FROM ModelPrice
)
```

f)
```
SELECT maker FROM Product, Printer WHERE
Product.model = Printer.model AND
Printer.color = TRUE AND
Printer.price <= ANY (
    SELECT price FROM Printer
);
```

Notes:

- EXISTS
  - EXISTS R is a condition that is true if and only if relation R is not empty

```
SELECT SupplierName
FROM Suppliers
WHERE EXISTS (SELECT ProductName FROM Products WHERE
Products.SupplierID = Suppliers.supplierID AND Price = 22);
```

- s IN R
  - is true if and only if s is equal to one of the values in R.
  - s NOT IN R true if and only if s has no value in R.

```
SELECT name
FROM MovieExec
WHERE cert# IN
    (SELECT producerC#
    FROM Movies
    WHERE (title, year) IN
        (SELECT movieTitle movieYear
        FROM StarsIn
        WHERE starName = 'Harrison Ford'
        )
    );
```

- $s >$ ANY R
  - is true if and only if s is greater than at least one value in unary relation R.
- $s >$ ALL R
  - is true if and only if s is greater than at least one value in unary relation R.

10. a)
```
SELECT country FROM Classes WHERE
numGuns >= ANY (
    SELECT numGuns FROM Classes
);
```

b)
```
SELECT name FROM Ships WHERE EXISTS (
    SELECT * FROM Outcome WHERE
    Ships.name = Outcomes.ship AND
    Outcome.result = 'sunk'
);
```

c)
```
SELECT name FROM Ships WHERE EXISTS (
    SELECT name FROM Ships, Classes WHERE
        Ships.class = Classes.class AND
        Classes.bore = 16
);
```

d)
```
SELECT battle FROM Outcomes WHERE EXISTS (
    WHERE EXISTS (
        SELECT * FROm Ships WHERE
        Outcomes.ship = Ships.name AND
        Ships.class = 'Kongo'
    )
);
```

11.

12.

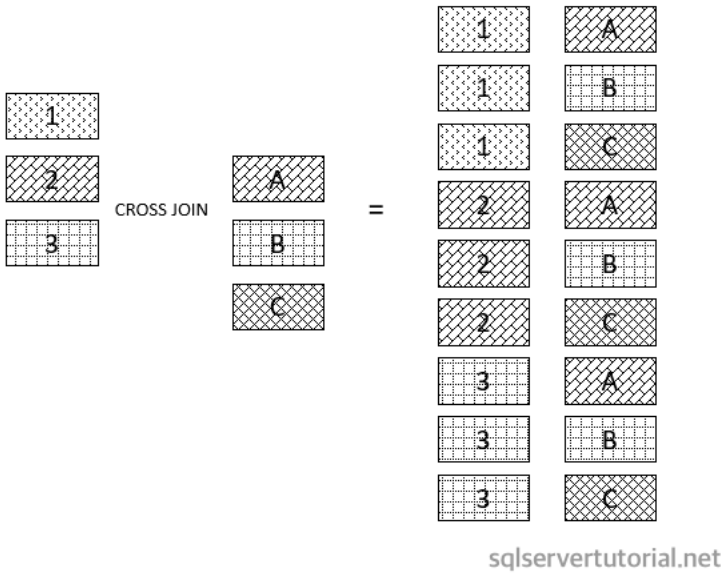
13. a) Cross join would result in the following attributes

(Studio.name, Studio.address, Studio.pressC#, MovieExec.name, MovieExec.address, MovieExec.cert#, MovieExec.networth)

With its tuples containing all possible combinations of values

Notes:

- **Cross Join:**
  - Is equivalent form of $R \times S$
  - Creates all possible combinations of values while keeping all all columns.


1
2
3
CROSS JOIN
A
B
C
=
1 A
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1 C
2 A
2 B
2 C
3 A
3 B
3 C
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