CS262- Problem Set 1

CS262- Database Systems
2021-CS-190 — Abdul Mateen

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Consider the following schema.
Company(name, city)
Description Relation list the company name and location of company in city attribute.

Product(name, maker, cost, year)
Description Each product has name, and manufacturer of product in maker, cost as purchase price, and year as the launch year of that particular product. product name is unique for all problems except problem No.4

Purchase(id, product, buyer, price)
Description Relation list the purchases made by customer listed in buyer columns, price as sale price, and product as name of product.

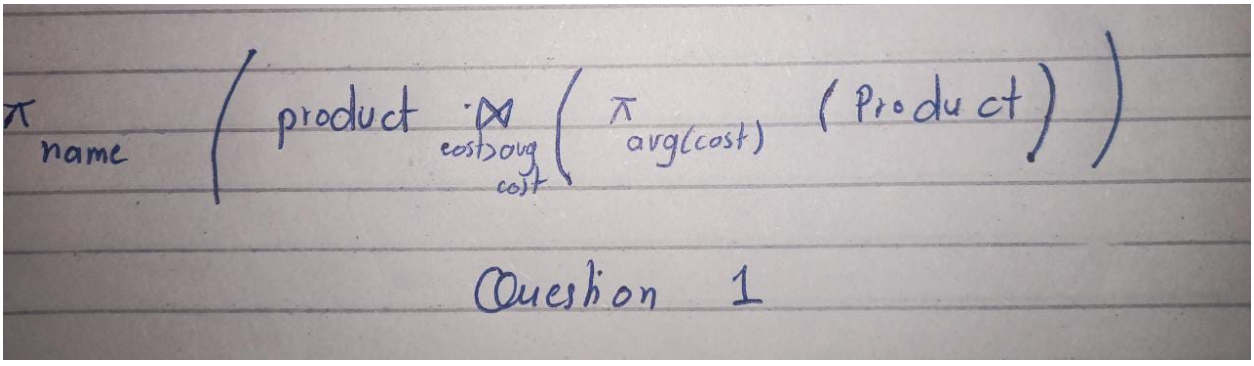
To-Do For each of the problems given below you are required to provide Relational algebra expression and at least five equivalent solutions in SQL, out of which one solution should be performed using

1. Cartesian product
2. Joins
3. Subquery

If any of the above solutions is not possible provide the reason as well.

Problem 1. Find the products(names only) whose cost is more than the average cost.

Solution.



Solution 1

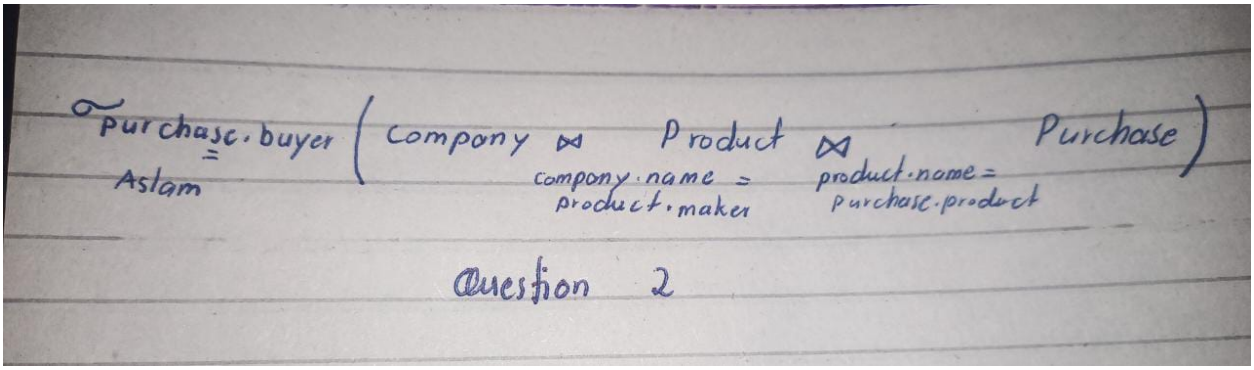
```
select name
from Product
where Product.cost > (
            Select Avg(cost)
            from Product
)
```

Solution 2

```
SELECT p.name
FROM Product p
JOIN (SELECT AVG(cost) AS avgCost
    FROM Product) q
ON p.cost > q.avgCost
```

□

Problem 2. List the name of companies whose products are bought by Aslam.



Solution.
Solution 1

```
select *
from Company
join Product
on Company.name = Product.maker
join Purchase
on Product.name = Purchase.product
where Purchase.buyer = 'Aslam'
```

Solution 2

```
select Company.name
from Company, Product, Purchase
where Company.name = Product.maker and
    Product.name = Purchase.product and
    Purchase.buyer = 'Aslam'
```

Solution 3

```
select c.name
from Company c
where c.name in (
    Select p.maker
    from Product p
    where p.name in (
            select product
            from Purchase
            where buyer='Aslam'
    )
)
```

□

Problem 3. List the name of products that are more expensive that all the products produced by Unilever.

Solution.
Solution 1

```
select name
from Product
where cost > (
    select SUM(cost)
    from Product
    where maker = 'Uniliver'
)
```

Solution 2

```
SELECT p.name
FROM Product p
JOIN (
    SELECT MAX(cost) maxcost
    FROM Product
    WHERE maker = 'Uniliver'
) q
ON p.cost > q.maxcost
```

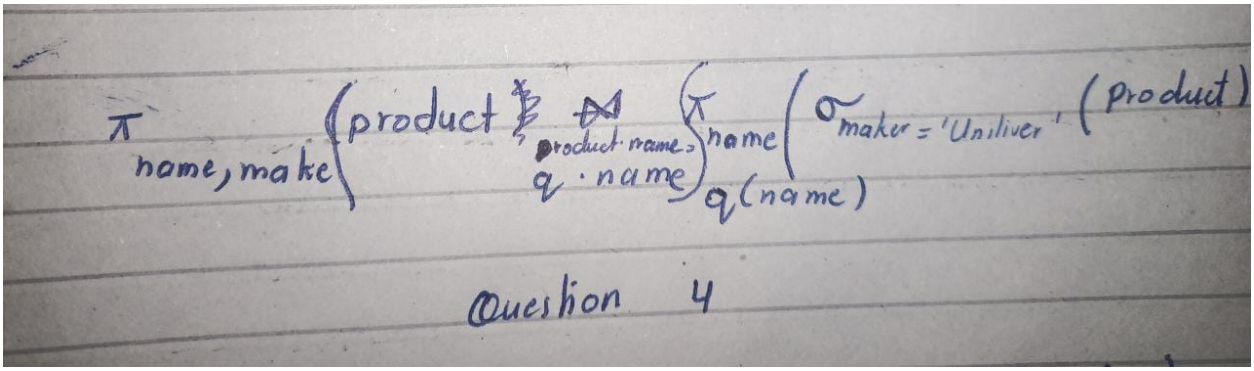
Solution 3

```
SELECT p.name
FROM Product AS p,(
    SELECT MAX(cost) maxcost
    FROM Product
    WHERE maker = 'Uniliver'
) q
where p.cost > q.maxcost
```

□

Problem 4. List the copy cat products along with manufacturer, i.e. the products that have the same name as produced by Unilever.

Solution.
Solution 1




```
select name,MAKER
from Product AS P
where P.maker = 'UNILIVER'
EXCEPT
SELECT DISTINCT NAME
FROM Product AS PR
WHERE PR.maker ='UNILIVER'
```

Solution 2

```
SELECT NAME,MAKER
FROM Product AS P
WHERE P.MAKER = 'UNILIVER' AND NAME NOT IN (
    SELECT DISTINCT NAME
    FROM Product AS PR
    WHERE MAKER = 'UNILIVER'
)
```

Solution 3

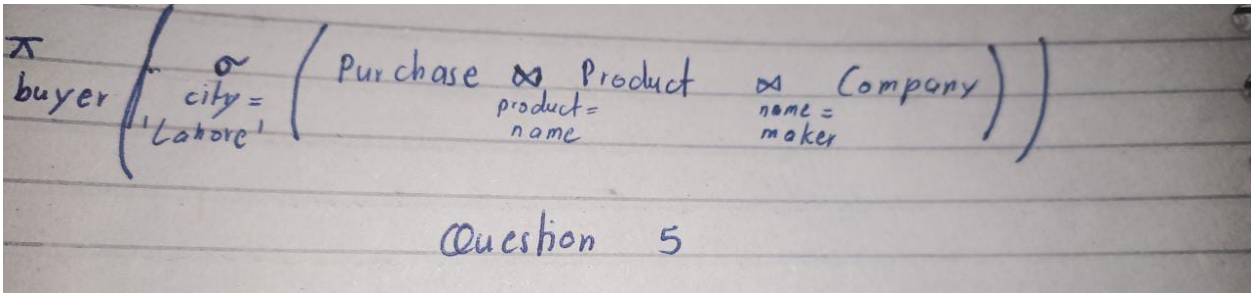
```
SELECT p.name, p.maker
FROM Product p
JOIN (SELECT name
    FROM Product
    WHERE maker = 'UNILIVER'
) q
ON p.name = q.name
WHERE p.maker <> 'UNILIVER'
```

Solution 4

```
SELECT p.name, p.maker
FROM Product p ,(
    SELECT name
    FROM Product
    WHERE maker = 'UNILIVER'
) q
WHERE p.maker <> 'UNILIVER' and p.name = q.name
```

□

Problem 5. Buyers of products produced in Lahore.



Solution.
Solution 1

```
select buyer
from Purchase
where product in (
    select name
    from Product
    where maker in (
            select name
            from Company
            where city = 'Lahore'
    )
)
```

Solution 2

```
select buyer
from Purchase
join Product
on Purchase.product = Product.name
join Company
on Company.name= Product_1.maker
where Company.city ='Lahore'
```

Solution 3

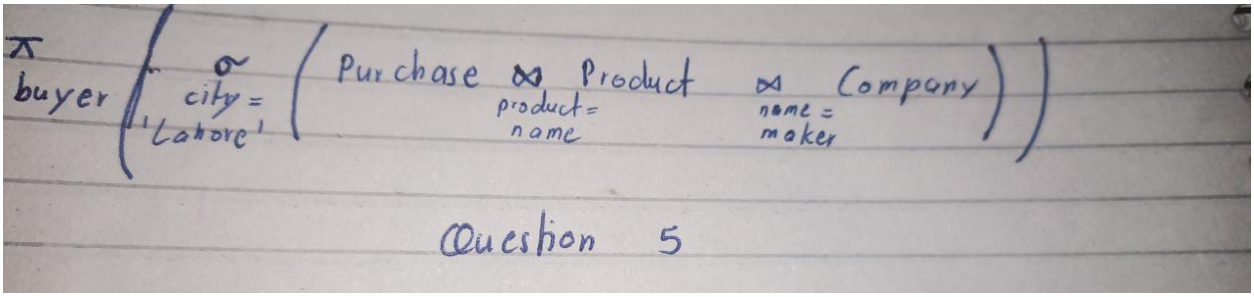
```
select buyer
from Purchase,(
    select name,maker
    from Product
) AS q,(
    select name,city
    from Company
) AS p
where p.city= 'Lahore' and q.maker=p.name and q.name = Purchase.product
```

□

Problem 6. List of buyers, who only buy the products 'Made in Karachi'.

Solution. solution 1

```
select Purchase.buyer
from Product
join company
on Product.maker= Company.name
```




```
join Purchase
on product.name = Purchase.product
EXCEPT
select Purchase.buyer
from Product
join company
on Product.maker= Company.name
join Purchase
on product.name = Purchase.product
where city<>'karachi'
```

SOLUTION 2

```
select Purchase.buyer
from Product,company ,Purchase
where product.name = Purchase.product and
 Product.maker= Company.name
EXCEPT
select Purchase.buyer
from Product, company , Purchase
where product.name = Purchase.product AND
    Product.maker= Company.name AND city<>'karachi'
```

□

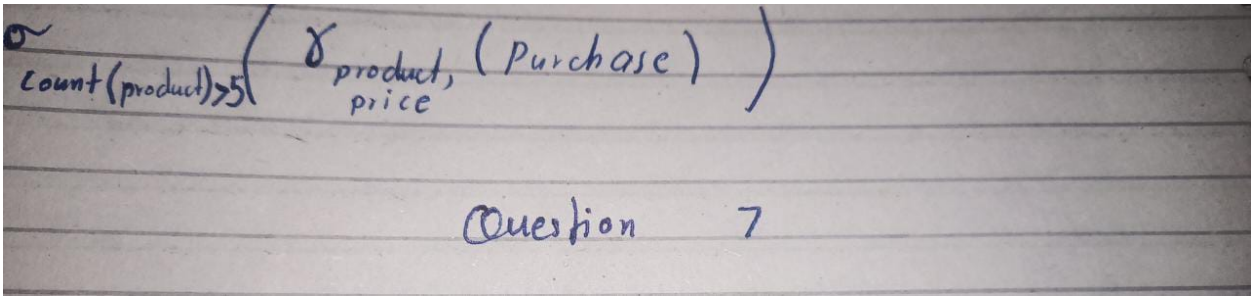
solution 3

```
select Purchase.buyer
from Product,company ,Purchase
where product.name = Purchase.product and
 Product.maker= Company.name AND Purchase.buyer NOT IN(
    select Purchase.buyer
    from Product, company , Purchase
    where product.name = Purchase.product AND
            Product.maker= Company.name AND city<>'karachi'
    )
```

Problem 7. Name and price of products bought by more than five customers.

Solution. Solution 1

```
SELECT P.product,P.price
FROM Purchase P
GROUP BY P.product,P.price
HAVING P.product IN(
    SELECT product
```




```
FROM Purchase
GROUP BY product
HAVING COUNT(product) > 5
)
```

Solution 2

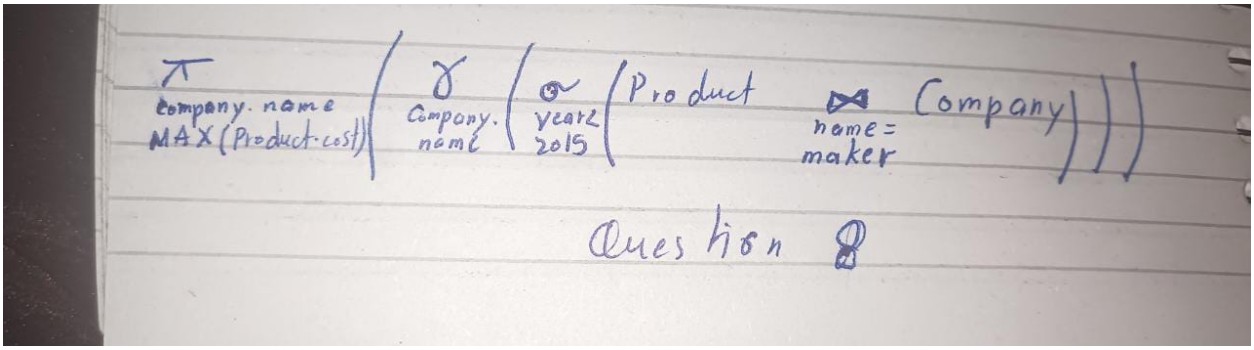
```
SELECT P.product ,P.price
FROM Purchase P
GROUP BY P.product ,P.price
HAVING COUNT(P.product) > 5
```

Solution 3

```
SELECT P.product ,AVG(P.PRICE) AS PRICE
FROM Purchase P
GROUP BY P.product
HAVING COUNT(P.product) > 5
```

□

Problem 8. List of products that are more expensive that all the products made by same company before 2015.



Solution. Solution 1

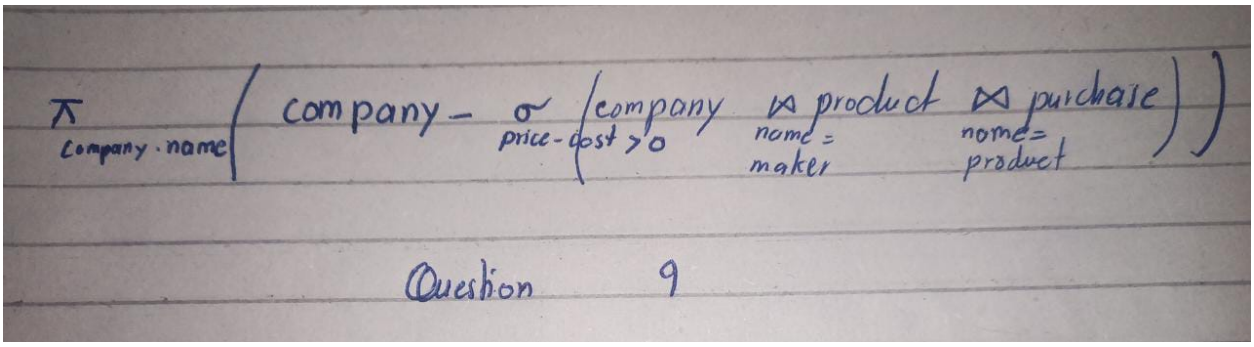
```
SELECT Company.name, MAX(PRODUCT_1.cost) AS [MAX PRICE PRODUCT]
FROM Product
JOIN Company
ON Product_1.maker = Company.name
WHERE YEAR < 2015
GROUP BY Company.name
```

Solution 2

```
SELECT Company.name, MAX(PRODUCT_1.cost) AS [MAX PRICE PRODUCT]
FROM Product ,Company
WHERE Product.maker = Company.name AND YEAR < 2015
GROUP BY Company.name
```

□

Problem 9. List of companies who never sale products with loss.



Solution. Solution 1

```
SELECT COMPANY.NAME
FROM COMPANY
EXCEPT
SELECT C.NAME
FROM COMPANY C
JOIN Product P
on C.NAME = P.MAKER
JOIN PURCHASE PR
ON PR.PRODUCT = P.NAME
WHERE PR.PRICE − P.COST > 0
```

Solution 2

```
SELECT COMPANY.NAME
FROM COMPANY
EXCEPT
SELECT C.NAME
FROM COMPANY C , Product_1 P , PURCHASE PR
WHERE C.NAME = P.MAKER AND
      PR.PRODUCT = P.NAME AND
      PR.PRICE − P.COST > 0
```

□

Problem 10. List the products which have more than average revenue in 2015 but below average revenue in 2016

Solution. Write a solution here □