

1.

SQL: select name from Person where age <18;

RA: $\pi_{name}(\sigma_{age < 18}(person))$

2.

SQL: SELECT pizzeria, pizza, price FROM (SELECT pizzeria, pizza, price FROM serves WHERE price < 10) as table1

NATURAL JOIN (SELECT pizza FROM eats WHERE name = 'Amy') as table2

RA:

$\pi_{pizzeria, pizza, price}(\sigma_{price < 10}(serves)) \bowtie \pi_{pizza}(\sigma_{name = "Amy"}(eats))$

3.

SQL: select pizzeria, name, age from Person Natural join Frequents where age <18;

RA:

$\pi_{pizzeria, name, age}(\sigma_{age < 18}((person) \bowtie (frequents)))$

4.

SQL: select pizzeria from Person Natural join Frequents where age <18 INTERSECT select pizzeria from Person Natural join Frequents where age >30;

RA:

$\pi_{pizzeria}(\sigma_{age < 18}((person) \bowtie (frequents))) \cap \pi_{pizzeria}(\sigma_{age > 30}((person) \bowtie (frequents)))$

5.

SQL: with table1 as (select pizzeria, name as person1, age as age1 from Person Natural join Frequents where age <18),
table2 as (select pizzeria, name as person2, age as age2 from Person Natural join Frequents where age >30) select * from
(table1 natural join table2);

RA:

$$\begin{aligned} table1 &= P_{table1(pizzeria, person1, age1)} \left(\pi_{pizzeria, name, age} \left(\sigma_{age < 18} (person) \bowtie (frequents) \right) \right) \\ table2 &= P_{table2(pizzeria, person2, age2)} \left(\pi_{pizzeria, name, age} \left(\sigma_{age > 30} (person) \bowtie (frequents) \right) \right) \\ table1 &\bowtie table2 \end{aligned}$$

6.

SQL: select * from (select name, count(pizza) as count from Eats group by name) as table3 where count > 1 order by count desc;

RA:

$$\tau_{count \text{ desc}} \left(\pi_{name, count} \left(\sigma_{count > 1} \left(\gamma_{name, count(pizza) \rightarrow count} (eats) \right) \right) \right)$$

7.

SQL: select pizza, avg(price) as avePrice from Serves group by pizza order by avePrice desc;

RA:

$$\pi_{pizza, avePrice} \left(\tau_{avePrice \text{ desc}} \left(\gamma_{pizza, avg(price) \rightarrow avePrice} (serves) \right) \right)$$