Schema for practice exercises

CUSTOMERS(FName, LName, CAddress, Account)

PRODUCTS(Prodname, Category)

SUPPLIERS(SName, SAddress, Chain)

orders((FName, LName) → CUSTOMERS,
SName → SUPPLIERS,
Prodname → PRODUCTS, Quantity)

offers(Sname → SUPPLIERS, Prodname → PRODUCTS, Price)

Exercise 1

Translate the following Datalog queries to (a) relational algebra, (b) SQL, and (c) English.

1.
```
ans(x,y) <- CUSTOMERS(x,y,_,z) AND z > 1000
```

2.
```
ans(x) <- SUPPLIERS(x,_,_) AND
          offers(x,y,_) AND
          PRODUCTS(y, "As seen on TV")
```

3.
```
cname(x) <- CUSTOMERS(x,_,_,_)
cname(y) <- CUSTOMERS(_,y,_,_)
sname(x) <- SUPPLIER(x,_,_)
pname(x) <- PRODUCT(x,_)
ans(x) <- cname(x) AND
          NOT sname(x) AND
          NOT pname(x)
```

Answers:

1. (a) $\pi_{\text{Fname,Lname}}(\sigma_{\text{Account}>1000}(\texttt{CUSTOMERS}))$

   (b)
   ```
   select Fname, LName
   from CUSTOMERS
   where Account > 1000;
   ```

   (c) Find names of customers with more than 1000 dollars in their accounts.

2. (a) $\pi_{\text{Sname}}(\sigma_{\text{Category} = \text{“As seen on TV”}}(\texttt{SUPPLIERS} \bowtie \texttt{offers} \bowtie \texttt{PRODUCTS}))$

   (b)
   ```
   select Sname
   from SUPPLIERS S, offers O, PRODUCTS P
   where S.Sname = O.Sname
    and O.Pname = P.Pname
    and P.Category = 'As Seen on TV';
   ```

   (c) Find all suppliers offering a product from the “as seen on TV” category.

Answers, cont'd:

3. (a)
$$\begin{array}{l}(\rho_{\text{Fname}\mapsto\text{name}}(\pi_{\text{Fname}}\ \texttt{CUSTOMERS}) \cup \\ \rho_{\text{Lname}\mapsto\text{name}}(\pi_{\text{Lname}}\ \texttt{CUSTOMERS})) - \\ (\rho_{\text{Sname}\mapsto\text{name}}(\pi_{\text{Sname}}\ \texttt{SUPPLIERS}) \cup \\ \rho_{\text{Pname}\mapsto\text{name}}(\pi_{\text{Pname}}\ \texttt{PRODUCTS}))\end{array}$$

(b)
```
select name from (
  select Fname as name
  from CUSTOMERS
  union
  select Lname as name
  from CUSTOMERS
) as S
except
select name from (
  select Sname as name
  from SUPPLIERS
  union
  select Pname as name
  from PRODUCTS
) as T
```

(c) Find all names (first or last) of customers that are not also names of products or suppliers.

Exercise 2

Translate the following queries to Datalog.

1. Find the names of products ordered by Jane Doe.

2. $\pi_{\text{Fname,Lname}}(\sigma_{\text{CAddress=SAddress}}(\texttt{CUSTOMERS} \bowtie \texttt{orders} \bowtie \texttt{SUPPLIERS}))$

3.
```
with recursive reachable(fname,lname) as (
  select fname, lname
  from CUSTOMERS
  union
  select C.fname, R.lname
  from CUSTOMERS C, reachable R
  where C.lname = R.fname
)
select fname, lname
from reachable
where fname = 'Eve';
```

Answers:

1.
```
ans(x) <- orders("Jane", "Doe", _, x, _)
```

2.
```
ans(x,y) <- CUSTOMERS(x,y,z,_) AND
            orders(x,y,u,_) AND
            SUPPLIERS(u,z,_)
```

3.
```
reachable(x,y) <- CUSTOMERS(x,y,_,_)
reachable(x,y) <- CUSTOMERS(x,z,_,_) AND
                  reachable(z,y)
ans(x,y) <- reachable(x,y) AND x = "Eve"
```