$\alpha_c(R)$ (selection

1. Find all the employees survived by Clare.

select distinct E.name from employee E where E.supervisedid
= (select E.id from employee E where E.name = 'clare');

$\pi_{E.name}(\sigma_{E.superviserid = \pi_{E.id}(\sigma_{E.name='clare'}(E))}(E))$.

2. Find the items sold by no department on the second floor.

(select S.item from sale S)

except (select S.item from sale S, dept D
where S.dept = D.name and D.floor = 2)

$(\pi_{S.item}(S) - \pi_{S.item}(\sigma_{S.dept=D.name \wedge D.floor=2}(S \times D)))$

3. select distinct I.name from item I
where not exists (select * from dept D where D.floor = 2
and not exists (select * from sale S where
S.item = I.name and S.dept = D.name));

translates to:

⇒ select I.name from item I except (select q2.name from
(select I.name as name, D.name as name2
from item I, dept D where d.floor = 2
except (select I.name, D.name from item I, dept D,
sale S where S.item = I.name and S.dept = D.name))
as q2);

$\pi_{name}(\pi_{name}(I) - \pi_{I.name}(\pi_{I.name, D.name}(\sigma_{D.floor=2}(I \times D)) - \pi_{I.name, D.name}(\sigma_{S.item=I.name \wedge S.dept=D.name}(I \times D \times S)))$

OR (using natural join)

$\pi_{name}(\pi_{name}(I) - \pi_{I.name}(\pi_{I.name, D.name}(\sigma_{D.floor=2}(I \times D)) - \pi_{I.name, D.name}(S \bowtie_{d.name=S.dept} D \bowtie_{S.item=I.name})))$

4 select distinct E.dept from employee E where E.dept <> 'Management' and E.dept not in (select E.dept from employee E, employee M where E.superuserid = M.id and E.salary >= M.salary);

translates to

→ select Q1.dept from ((select dept from employee where dept <> 'Management') except (select e.dept from employee E, employee M where E.superuserid = M.id and E.salary >= M.salary)) as Q1;

$\pi_{dept}(\pi_{dept}(\sigma_{dept \neq 'Management'}(E)) - \pi_{dept}(E \bowtie_{E.superuserid = M.id \wedge E.salary >= M.salary} M))$

5. select * from supplier S where not exists (select * from item I where I.type = 'N' and not exists (select * from delivery D where D.item = I.name and D.supplier = S.id));

translates to

→ select S.id, s.name from supplier S except (select Q.id, Q.name from (select S.id, S.name as name, I.nme as item from supplier S, item I where I.type = 'N' except (select S.id, S.name, I.name from supplier S, item I, delivery D where D.item = I.name and D.supplier = S.id)) as Q);

π1 $\pi_{id,name}(\pi_{id,name}(S)) - \pi_{s.id,s.name}(\pi_{s.id,s.name,I.name}(\sigma_{I.type='N'}(S \times I)) - (\pi_{s.id,s.name,I.name}(D \bowtie_{D.item=I.name} I) \bowtie_{D.supplier=s.id} S)))$

6. select distinct D.supplier, S.name from supplier S, delivery D where D.supplier = S.id and D.item <> 'Compass' and D.supplier in (select D.supplier from delivery D where D.item = 'Compass');

translates to

→ select distinct D.supplier, S.name from supplier S, delivery D, delivery D1 where D.supplier = S.id and D.item <> 'compass' and D.supplier = D1.supplier and D1.item = 'Compass';

$\pi_{supplier,name}(\sigma_{D.supplier=S.id \wedge D.item <> 'Compass' \wedge D.supplier = D1.supplier \wedge D1.item = 'Compass'}(S \times D \times D_1))$

7. select D.name from dept D where D.name not in (select D.name from dept D where exists (select * from item I where I.type = 'N' and exists (select * from sale S where S.dept = D.name and S.item = I.name)));

Translates to →

select name from dept except (select d.name from dept D, item I, sale S where I.type = 'N' and S.dept = D.name and s.item = I.name)

$\pi_{name}(D) - \pi_{name}(\sigma_{I.type='N' \wedge s.dept=D.name \wedge S.item=I.name}(D \times I \times S))$

8. select S.name from supplier S where exists (select * from dept D where D.floor = 2 and not exists (select * from item I where I.type = 'c' and not exists (select * from delivery V where V.supplier = S.id and V.item = I.name and V.dept = D.name));

translates to →

select q2.name from ((select S.name as name, d.name as dept2 from supplier S, dept D where D.floor = 2) except (select q.name, q.dept from (select S.name as name, I.name as name2, D.name as dept from supplier S, dept D, item I where I.type = 'c') except (select S.name, I.name, D.name from supplier S, dept D, item I, delivery V where V.supplier = s.id and V.item = I.name and V.dept = D.name)) as q) as q2

$\pi_{s.name}(\pi_{s.name,D.name}(\sigma_{D.floor=2}(S \times D)) - \pi_{s.name,D.name}(\pi_{s.name,I.name,D.name}(\sigma_{I.type='c'}(S \times D \times I)) - \pi_{s.name,I.name,D.name}(\sigma_{V.supplier=S.id \wedge V.item=I.name \wedge V.dept=D.name}(S \times D \times I \times V))))$

7. select distinct S.name as "supplier", I.name as "Item"
from supplier S, item I, delivery V1 where S.id = V1.supplier
and V1.item = I.name and I.name not in
(select V2.item from delivery V2 ... <>
where V2.supplier <> V1.supplier);

translates to
→ (select distinct I.name, S.name from Supplier S, item I, delivery V1
where S.id = V1.supplier and V1.item = I.name) except
(select distinct I.name, S.name from Supplier S, delivery V1, delivery V2, item I
where S.id = V1.supplier and V1.item = I.name and V1.supplier <> V2.supplier
and I.name = V2.item);

$\pi_{I.name, S.name}(\pi_{I.name, S.name}(\sigma_{S.id = V1.supplier \wedge V1.item = I.name}(S \times I \times V_1)) -$

$\pi_{I.name, S.name}(\sigma_{S.id = V1.supplier \wedge V1.item = I.name \wedge V1.supplier \neq V2.supplier \wedge I.name = V2.item}(S \times V_1 \times V_2 \times I)))$