

# Colours Schema

| Customer   |    |
|------------|----|
| cust#      | PK |
| cname      |    |
| fav_colour |    |
| phone#     |    |

| Item      |                |
|-----------|----------------|
| item#     | PK             |
| prod#     | FK to Product  |
| cust#     | FK to Customer |
| colour    |                |
| date_sold |                |

| Product |               |
|---------|---------------|
| prod#   | PK            |
| pname   |               |
| cost    |               |
| maker   | FK to Company |

| Avail_Colours |                   |
|---------------|-------------------|
| prod#         | PK, FK to Product |
| colour        | PK                |

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## Query 1.

Show, for each customer (reporting the customer's name), the products by name that come in the customer's favourite colour.

```
select C.cname, P.pname
      from Customer C, Avail_Colours A,
           Product P
     where C.fav_colour = A.colour
           and A.prod# = P.prod#;
```

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## Query 2.

Show, for each customer (reporting the customer's name), the products by name that *do not* come in the customer's favourite colour.

```
select C.cname, P.pname
       from Customer C, Product P
       where C.fav_colour not in (
           select A.colour
                from Avail_Colours A
                where A.prod# = P.prod#
        );
```

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## Query 2. (B)

```
select C.cname, P.pname
       from Customer C, Product P,
       ( select distinct Q.prod#, A.colour
         from Product Q,
              Avail_Colours A
         except
         select prod#, colour
         from Avail_Colours
       ) as N
       where C.fav_colour = N.colour
              and P.prod# = N.prod#;
```

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## Query 2. (C)

```
with
  NotAvail (prod#, colour) as (
    select distinct Q.prod#, A.colour
      from Product Q,
           Avail_Colours A
    except
    select prod#, colour
      from Avail_Colours
  )
select C.cname, P.pname
  from Customer C, Product P, NotAvail N
 where C.fav_colour = N.colour
    and P.prod# = N.prod#;
```

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## Query 3.

List pairs of customers (columns: first\_cust#, first\_cname, second\_cust#, second\_cname) such that the two customers own at least two products in common.

```
select distinct C.cust#, C.cname, D.cust#, D.cname
  from Customer C, Customer D, Item IC, Item JC, Item ID, Item JD
 where C.cust# = IC.cust# and C.cust# = JC.cust# and
       D.cust# = ID.cust# and D.cust# = JD.cust# and
       IC.prod# = ID.prod# and JC.prod# = JD.prod# and
       IC.prod# <> JC.prod# and
       C.cust# < D.cust#;
```

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## Query 4.

List customers who own items in all the available colours.  
That is, for every available colour, the customer owns some item in that colour.

```
select cust#, cname
  from Customer
except
select C.cust#, C.cname
  from ( select D.cust#, A.colour
         from Customer D,
              Avail_Colours A
        except
         select I.cust#, I.colour
         from Item I
        ) as M,
      Customer C
 where C.cust# = M.cust#;
```

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## Query 5.

List each customer by name, paired with the product(s) by name that he or she has bought that was the most expensive (cost) of all the products he or she has bought.

```
select C.cname, P.pname
  from ( select distinct cust#, prod#
         from Item
        except
         select I.cust#, I.prod#
         from Item I, Item J, Product Q, Product R
         where I.cust# = J.cust# and
              I.prod# = Q.prod# and J.prod# = R.prod# and
              Q.cost < R.cost
        ) as M,
      customer C, Product P
 where C.cust# = M.cust# and P.prod# = M.prod#;
```

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## Query 6.

Show, for each customer, the total cost he or she has paid for products in his or her favourite colour.

```
select C.cust#, C.name,  
       sum(P.cost) as total  
from Customer C, Item I,  
       Product P  
where C.cust# = I.cust#  
       and I.prod# = P.prod#  
       and C.fav_colour = I.colour  
group by C.cust#, C.cname;
```

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## Query 7.

Report with columns `cust#` and `colour` for each customer which colour he or she has spent more on products of that colour than on products of any other colour.

```
with  
  Colours (cust#, colour, total) as (  
    select I.cust#, I.colour, sum(P.cost)  
    from Item I, Product P  
    where I.prod# = P.prod#  
    group by I.cust#, I.colour  
  ),  
  :
```

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## Query 7. (p.2)

```
with
  :
  Most (cust#, highest) as (
    select C.cust#, max(C.total)
    from Colours C
    group by cust#
  )
  :
```

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## Query 7. (p.3)

```
  :
select C.cust#, C.cname, R.colour, M.highest
from Customer C, Colour R, Most M
where C.cust# = R.cust#
and C.cust# = M.cust# and
R.total = M.highest;
```

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## Query 8.

What is the total each customer has spent on items *since* his or her most expensive purchase?  
In case of ties for the most expensive purchase, count since the *first* most expensive purchase.

with

```
Expensive (cust#, cost) as (  
    select I.cust#, max(P.cost)  
        from Item I, Product P  
        where I.prod# = P.prod#  
        group by I.cust#  
    ),  
    :
```

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## Query 8. (p.2)

with

```
    :  
    First (cust#, when) as (  
        select I.cust#, min(date_sold)  
            from Item I,  
                Expensive E,  
                Product P  
            where I.cust# = E.cust#  
                and I.prod# = P.prod#  
                and P.cost = E.cost  
            group by I.cust#  
        )  
    :
```

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## Query 8. (p.3)

```
⋮
select C.cust#, C.cname, sum(P.cost) as total
  from Customer C, Item I,
       Product P, First F
 where C.cust# = I.cust#
       and C.cust# = F.cust#
       and I.prod# = P.prod#
       and I.date_sold > F.when
 group by C.cust#, C.cname;
```

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## Query 9.

Which pairs of customers own at least twelve products in common?

```
with
  Owned (cust#, prod#) as (
    select distinct cust#, prod#
      from Item
    )
  ⋮
```

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## Query 9. (p.2)

```
⋮
select C.cust#, C.cname,
       D.cust#, D.cname
from Customer C, Customer D,
       Owned P, Owned Q
where C.cust# = P.cust#
     and D.cust# = Q.cust#
     and P.prod# = Q.prod#
     and C.cust# < D.cust#
group by C.cust#, C.cname,
         D.cust#, D.cname
having count(*) >= 12;
```

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## Query 10.

Query 5 again: List each customer by name, paired with the product(s) by name that he or she has bought that was the most expensive (cost) of all the products he or she has bought.

Hey, but you have aggregation now!

```
with
  Expensive (cust#, highest) as (
    select I.cust#, max(P.cost)
           from Item I, Product P
           where I.prod# = P.prod#
           group by I.cust#
  )
⋮
```

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## Query 10. (p.2)

```
⋮
select C.cname, P.pname
       from Customer C, Item I,
          Product P, Expensive E
where C.cust# = I.cust#
      and C.cust# = E.cust#
      and I.prod# = P.prod#
      and P.cost = E.highest;
```

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## Recursion: E.g., Bosses

```
with
  Boss (emp#, boss#) as (
    select emp#, boss#
       from Employee
    union all
    select E.emp#, B.boss#
       from Boss B, Employee E
       where E.boss# = B.emp#
  ),
select E.emp#, E.name as ename,
       B.boss#, F.name as bname
   from Boss B, Employee E, Employee F
  where B.emp# = E.emp#
        and B.boss# = F.emp#;
```

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## Counting (w/o Aggregation!)

```
with
  First (a, b, r#) as (
    select a, b, 0
      from Data
    except
    select Y.a, Y.b, 0
      from Data Y, Data Z
     where (Y.a > Z.a) or
           ((Y.a >= Z.a) and (Y.b > Z.b))
  ),
  :
```

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## Counting (p.2)

```
with
  :
  Counter (a, b, r#) as (
    select a, b, r#
      from First
    union all
    select D.a, D.b, C.r# + 1
      from Counter C, Data D
     where (D.a > C.a) or
           ((D.a >= C.a) and (D.b > C.b))
  )
  :
```

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## Counting (p.3)

```
select a, b, r#
       from Counter
except
select M.a, M.b, M.r#
       from Counter M, Counter X
       where M.a = X.a
             and M.b = X.b
             and M.r# < X.r#
order by a, b;
```