

Relational Model

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Test for Empty Relations

- The **exists** construct returns the value **true** if the argument subquery is nonempty.
- **exists** $r \Leftrightarrow r \neq \emptyset$
- **not exists** $r \Leftrightarrow r = \emptyset$

Test for Empty Relations

- Find all customer names who have both a loan and an account.

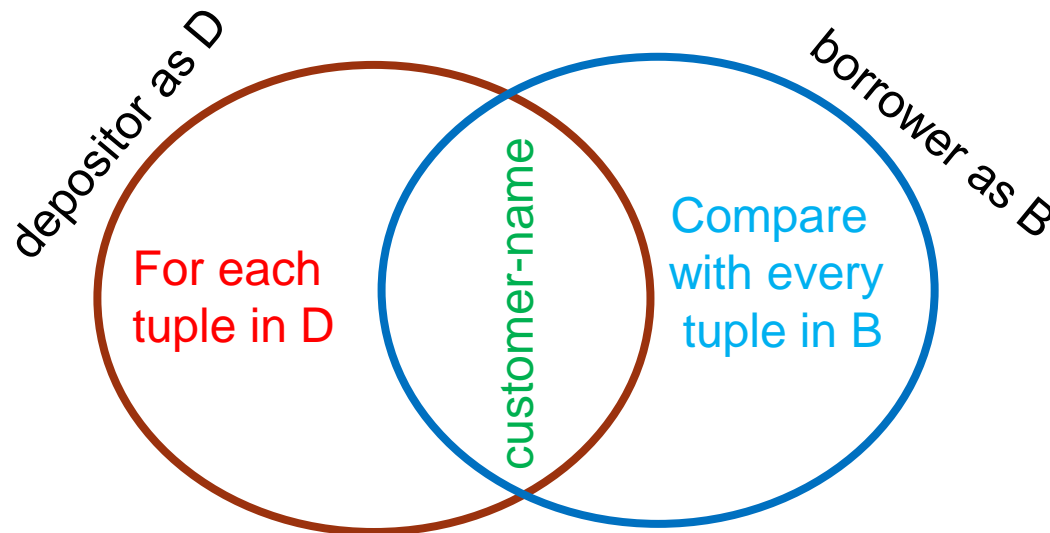
select customer-name

from depositor as D

where exists (**select** *

from borrower as B

where D.customer-name = B.customer-name)



Test for Empty Relations

- Find all customer names who have an account but no loan.

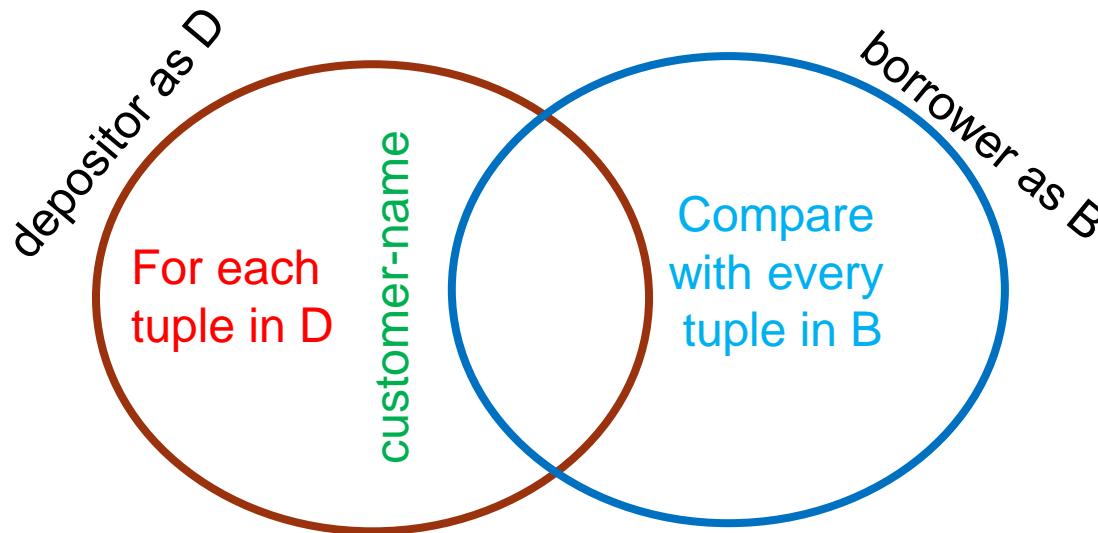
select customer-name

from depositor as D

where not exists (select *

from borrower as B

where D.customer-name = B.customer-name)



Correlated Nested Query

- Find all customers who have an account at all branches located in Brooklyn.

select distinct *S.customer-name*
from *depositor* **as** *S*

where not exists (

(**select** *branch-name*
from *branch*

where *branch-city* = 'Brooklyn')

except

(**select** *R.branch-name*

from *depositor* **as** *T*, *account* **as** *R*

where *T.account-number* = *R.account-number* **and**

S.customer-name = *T.customer-name*))

For each customer *S*, check

All branches at Brooklyn

Branches where customer *S*
has an account

- (Schema used in this example)
- Note that $X - Y = \emptyset \Leftrightarrow X \subseteq Y$
- Note: Cannot write this query using = **all** and its variants

Example Query

- Find all customers who have an account at all branches located in Brooklyn.

```
select distinct S.customer-name
from depositor as S
where not exists (
    (select branch-name
    from branch
    where branch-city = 'Brooklyn')
except
    (select R.branch-name
    from depositor as T, account as R
    where T.account-number = R.account-number and
        S.customer-name = T.customer-name))
```



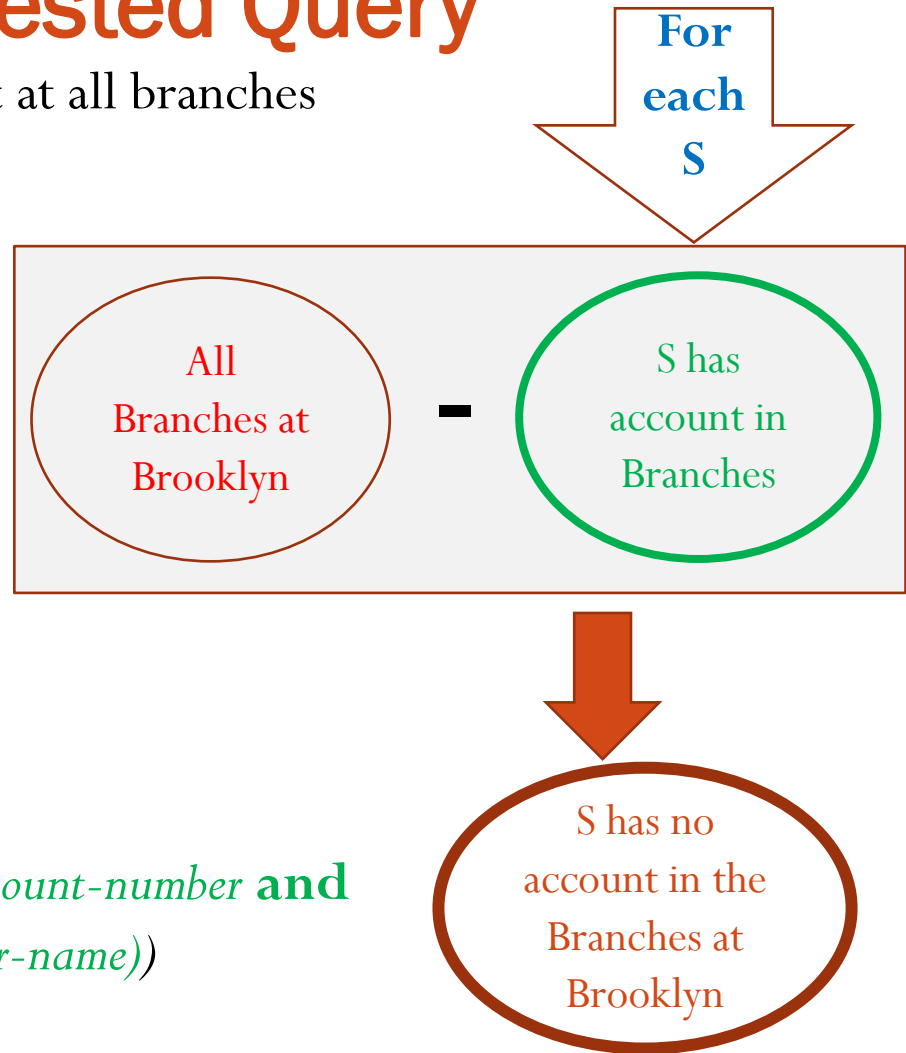
Branches in Brooklyn where
customer *S* doesn't have an account

- (Schema used in this example)
- Note that $X - Y = \emptyset \Leftrightarrow X \subseteq Y$
- Note: Cannot write this query using = **all** and its variants

Correlated Nested Query

- Find all customers who have an account at all branches located in Brooklyn.

```
select distinct S.customer-name
from depositor as S
where not exists (
  (select branch-name
   from branch
   where branch-city = 'Brooklyn')
 except
  (select R.branch-name
   from depositor as T, account as R
   where T.account-number = R.account-number and
        S.customer-name = T.customer-name))
```

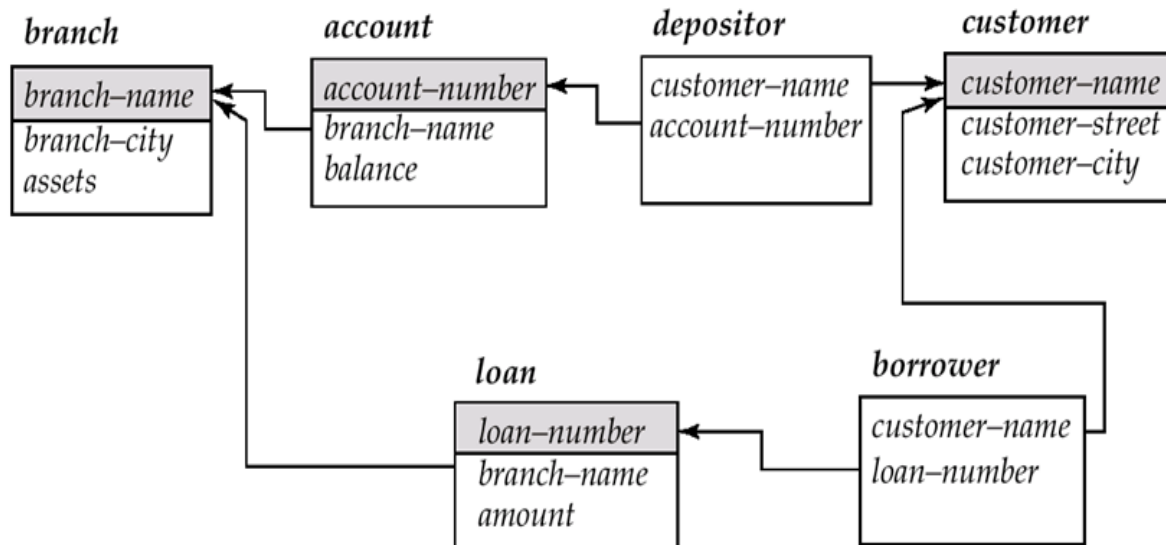


- Note that $X - Y = \emptyset \Leftrightarrow X \subseteq Y$
- Note: Cannot write this query using **= all** and its variants

Test for Absence of Duplicate Tuples

- The **unique** construct tests whether a subquery has any duplicate tuples in its result.
- Find all customers who have at most one account at the Perryridge branch.

```
select T.customer-name
from depositor as T
where unique (
    select R.customer-name
    from account, depositor as R
    where T.customer-name = R.customer-name and
          R.account-number = account.account-number and
          account.branch-name = 'Perryridge')
```



For
each
T

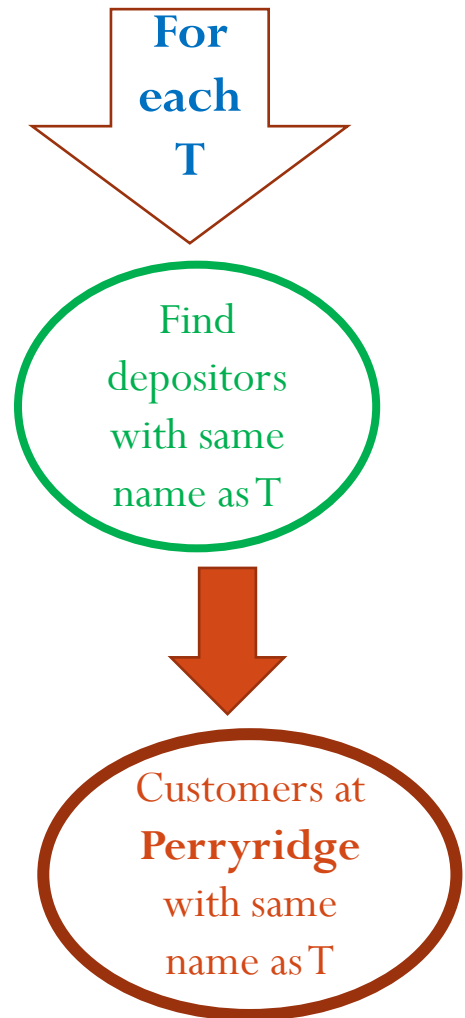
Find
depositors
with same
name as T

Customers at
Perryridge
with same
name as T

Example Query

- Find all customers who have at least two accounts at the Perryridge branch.

```
select distinct T.customer-name
from depositor as T
where not unique (
    select R.customer-name
    from account, depositor as R
    where T.customer-name = R.customer-name and
R.account-number = account.account-number and
account.branch-name = 'Perryridge')
```



Class Participation
Quiz-01
(15 Minutes)

THANK YOU