## Nested Subqueries

- SQL provides a mechanism for the nesting of subqueries.
- A <u>subquery</u> is a <u>select-from-where</u> expression that is nested within another query.
- A common use of subqueries is to perform tests for set membership, set comparisons, and set cardinality.

# Nested queries

- At the end of class last time we attempted to create a query that returns (from the university dataset):
  - The building that houses the departments with the largest average budget.
- We came up with:
  - select building, avg\_budget
    from
     (select building, avg(budget) as avg\_budget from department group by building)
     as avg\_budgets
    where avg\_budget = (select max(avg\_budget) from
     (select building, avg(budget) as avg\_budget from department group by building)
     as avg\_budgets);
- Alternatively, we can use the with clause
- with avg\_budgets(building, avg) as
   (select building, avg(budget) from department group by building)
  select building, avg
  from avg\_budgets
  where avg = (select max(avg) from avg\_budgets)

### Multi-comparisons

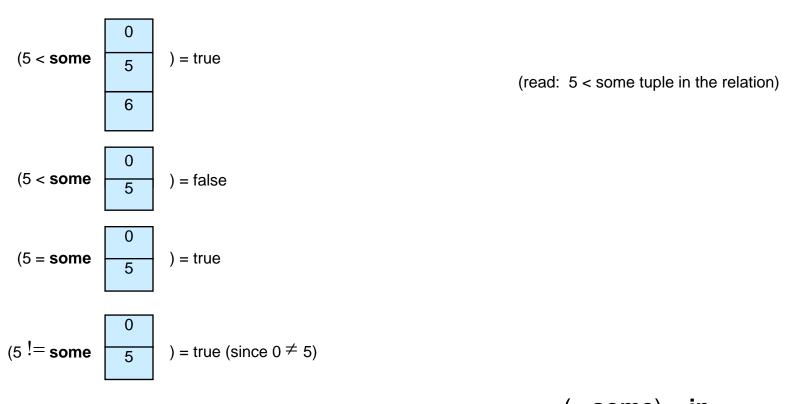
- So far we've seen simple predicates in WHERE clause
  - SELECT \* from table where val = 4;
  - SELECT \* from table where val > 4;
- What if you want to compare a value with multiple other values?
- select \* from table where val = "at least one of" (5, 6, 7);
  - Above example can be done with OR
    - where val = 5 or val = 6 or val = 7
  - But what about:
    - select \* from table
       where val = "at least one of" (select some\_att from other\_table);
  - Solution: Use the IN keyword
    - select \* from table where val IN (5, 6, 7);
    - select \* from table where val IN (select some\_att from other\_table);

## Popular WHERE-clause comparisons

- IN: equals at least one of
- NOT IN: != all of
- EXISTS r: returns true if r is not empty
- NOT EXISTS r: returns true if r is empty
- SOME, ALL --- see next two slides
- See examples of these comparison operations in the companion SQL examples document from today

#### Some Clause

• F <comp> some  $r \Leftrightarrow \exists t \in r \text{ such that (F <comp> } t \text{ )}$ Where <comp> can be: <, >=, >, =, !=, <>



 $(= some) \equiv in$ However, (!= some) is not the same as **not in** 

#### Definition of all Clause

• F <comp> **all**  $r \Leftrightarrow \forall t \in r \text{ (F } <$ comp> t)

