### Local Tables

A create table statement names a table globally

```sql
create table parents as
select "abraham" as parent, "barack" as child union
select "abraham", "clinton" union
select "delano", "herbert" union
select "fillmore", "abraham" union
select "fillmore", "delano" union
select "fillmore", "grover" union
select "eisenhower", "fillmore";
```

### Example: Relationships

**(A)** What are appropriate names for the columns in this result?
**(B)** How many rows and columns will result?

#### Part of the select statement

```sql
with what(first, second) as (
    select a.child, b.child
    from parents as a, parents as b
    where a.parent = b.parent and
    a.child != b.child
)
select child as __________, second as __________ from parents, what
where parent = first;
```

### Local Tables can be Declared Recursively

An ancestor is your parent or an ancestor of your parent

```sql
create table parents as
select "abraham" as parent, "barack" as child union
select "abraham", "clinton" union
select "delano", "herbert" union
select "fillmore", "abraham" union
select "fillmore", "delano" union
select "fillmore", "grover" union
select "eisenhower", "fillmore";
```

#### Recursive Local Tables

```sql
create table ancestors(ancestor, descendent)
with ancestors(ancestor, descendent) as (
    select parent, child
    from parents
    union
    select ancestor, child
    from ancestors, parents
    where parent = descendent
)
select ancestor from ancestors where descendent = "herbert";
```
Global Names for Recursive Tables

To create a table with a global name, you need to select the contents of the local table.

```sql
create table odds as
with
  odds(n) as
    (select 1 union select n+2 from odds where n < 15)
select n from odds;
```

Which names above can change without affecting the result?

Limits on Recursive Select Statements

Recursive table definitions are only possible within a with clause.

No mutual recursion: two or more tables cannot be defined in terms of each other.

```sql
with
  odds(x) as
    (select 1 union select x+1 from evens)
  evens(x) as
    (select x+1 from odds)
select x from odds
with
  ints(x) as
    (select 1 union select x-1 union select x+1 from ints)
select x from ints;
```

Language is Recursive

Noun phrases can contain relative pronouns that introduce relative clauses.

```sql
The dog chased the cat
  that chased the bird
The dog chased the cat
  that the bird chased
The dog chased the cat
  the bird chased
Bulldogs bulldogs bulldogs bulldogs fight fight fight
```

Input-Output Tables

A table containing the inputs to a function can be used to map from output to input.

```sql
create table pairs as
with
  i(n) as
    (select 1 union select n+1 from i where n < 50)
select a.n as x, b.n as y from i as a, i as b
  where a.n <= b.n;
```

What integers can I add/multiply together to get 24?

Example: Pythagorean Triples

All triples a, b, c such that a^2 + b^2 = c^2

```sql
create table fibs as
with
  fib(previous, current) as
    (select 0, 1 union select current, previous + current from fib
      where current <= 15)
select a.n as a, b.n as b, c.n as c
  from _______________________________________
where __________________ and a.n * a.n + b.n * b.n = c.n * c.n;
```

Example: Fibonacci Sequence

Computing the next Fibonacci number requires both the previous and current numbers.

```sql
create table fibs as
with
  fib(previous, current) as
    (select 0, 1 union select current, previous + current from fib
      where current <= 15)
select a.n as a, b.n as b, c.n as c
  from _______________________________________
where __________________ and a.n * a.n + b.n * b.n = c.n * c.n;
```
A Very Interesting Number

The mathematician G. H. Hardy once remarked to the mathematician Srinivasa Ramanujan...

(Demo)