Announcements
Joining Tables
Reminder: John the Patriotic Dog Breeder

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";

Parents:

<table>
<thead>
<tr>
<th>Parent</th>
<th>Child</th>
</tr>
</thead>
<tbody>
<tr>
<td>abraham</td>
<td>barack</td>
</tr>
<tr>
<td>abraham</td>
<td>clinton</td>
</tr>
<tr>
<td>delano</td>
<td>herbert</td>
</tr>
<tr>
<td>fillmore</td>
<td>abraham</td>
</tr>
<tr>
<td>fillmore</td>
<td>delano</td>
</tr>
<tr>
<td>fillmore</td>
<td>grover</td>
</tr>
<tr>
<td>eisenhower</td>
<td>fillmore</td>
</tr>
</tbody>
</table>
Joining Two Tables

Two tables A & B are joined by a comma to yield all combos of a row from A & a row from B

create table dogs as
    select "abraham" as name, "long" as fur union
    select "barack", "short" union
    select "clinton", "long" union
    select "delano", "long" union
    select "eisenhower", "short" union
    select "fillmore", "curly" union
    select "grover", "short" union
    select "herbert", "curly";

create table parents as
    select "abraham" as parent, "barack" as child union
    select "abraham", "clinton" union
    ...

Select the parents of curly-furred dogs

    select parent from parents, dogs
    where child = name and fur = "curly";

(Demo)
Aliases and Dot Expressions
Joining a Table with Itself

Two tables may share a column name; dot expressions and aliases disambiguate column values

```sql
select [columns] from [table] where [condition] order by [order];
```

[table] is a comma-separated list of table names with optional aliases

Select all pairs of siblings

```sql
select a.child as first, b.child as second
from parents as a, parents as b
where a.parent = b.parent and a.child < b.child;
```

<table>
<thead>
<tr>
<th>First</th>
<th>Second</th>
</tr>
</thead>
<tbody>
<tr>
<td>barack</td>
<td>clinton</td>
</tr>
<tr>
<td>abraham</td>
<td>delano</td>
</tr>
<tr>
<td>abraham</td>
<td>grover</td>
</tr>
<tr>
<td>delano</td>
<td>grover</td>
</tr>
</tbody>
</table>
Example: Grandparents

Which select statement evaluates to all grandparent, grandchild pairs?

1. `select a.grandparent, b.child from parents as a, parents as b
   where b.parent = a.child;`

2. `select a.parent, b.child from parents as a, parents as b
   where a.parent = b.child;`

3. `select a.parent, b.child from parents as a, parents as b
   where b.parent = a.child;`

4. `select a.grandparent, b.child from parents as a, parents as b
   where a.parent = b.child;`

5. None of the above
Joining Multiple Tables

Multiple tables can be joined to yield all combinations of rows from each

create table grandparents as
  select a.parent as grandog, b.child as granpup
  from parents as a, parents as b
  where b.parent = a.child;

Select all grandparents with the same fur as their grandchildren

Which tables need to be joined together?

  select grandog from grandparents, dogs as c, dogs as d
  where grandog = c.name and
    granpup = d.name and
    c.fur = d.fur;
Example: Dog Triples
Write a SQL query that selects all possible combinations of three different dogs with the same fur and lists each triple in *inverse* alphabetical order.

```sql
create table dogs as
    select "abraham" as name, "long" as fur
    union
    select "barack" , "short" union
    ...;

create table parents as
    select "abraham" as parent, "barack" as child
    union
    select "abraham" , "clinton" union
    ...;
```

Expected output:

```
delano|clinton|abraham
grover|eisenhower|barack
```

(Demo)
Numerical Expressions
Numerical Expressions

Expressions can contain function calls and arithmetic operators

\[
\text{[expression] as [name], [expression] as [name], ...}
\]

\[
\text{select [columns] from [table] where [expression] order by [expression] ;}
\]

Combine values: +, -, *, /, %, and, or

Transform values: abs, round, not, -

Compare values: <, <=, >, >=, <>, ! =, =

(Demo)
String Expressions
String Expressions

String values can be combined to form longer strings

```sql
sqlite> select "hello," || " world";
hello, world
```

Basic string manipulation is built into SQL, but differs from Python

```sql
sqlite> create table phrase as select "hello, world" as s;
sqlite> select substr(s, 4, 2) || substr(s, instr(s, " ")+1, 1) from phrase;
low
```

Strings can be used to represent structured values, but doing so is rarely a good idea

```sql
sqlite> create table lists as select "one" as car, "two,three,four" as cdr;
sqlite> select substr(cdr, 1, instr(cdr, ",")-1) as cadr from lists;
two

(Demo)
```