SQL Tables

Class outline:

- Creating tables
- Joining tables
- Table aliases
- Numerical expressions
- String expressions

Creating tables

Creating tables with SELECT

The `CREATE TABLE` statement can be used to create a table in various ways.

Creating a table with the results of a `SELECT`:

```
CREATE TABLE top_music_videos AS
    SELECT title, views FROM songs ORDER BY views DESC;
```

That limits the new table to a subset of existing data, however.

Creating tables with UNION

It's possible to use a `SELECT` to create a row of entirely new data, and save that into a table.

```
CREATE TABLE musical_movies AS
    SELECT "Mamma Mia" as title, 2008 as release_year;
```

Creating tables with UNION

It's possible to use a `SELECT` to create a row of entirely new data, and save that into a table.

```
CREATE TABLE musical_movies AS
    SELECT "Mamma Mia" as title, 2008 as release_year;
```

We can use `UNION` to merge the results of multiple `SELECT` statements:

```
CREATE TABLE musical_movies AS
    SELECT "Mamma Mia" as title     , 2008 as release_year UNION
    SELECT "Olaf's Frozen Adventure", 2017  UNION
    SELECT "Across the Universe"    , 2007  UNION
    SELECT "Moana"                  , 2016  UNION
    SELECT "Moulin Rouge"           , 2001;
```

2-step table creation

The most common approach is to first use `CREATE` to declare the column names and types:

```
CREATE TABLE musical_movies (title TEXT, release_year INTEGER);
```

Then use `INSERT` to insert each row of data:

```
INSERT INTO musical_movies VALUES ("Mamma Mia", 2008);
INSERT INTO musical_movies VALUES ("Olaf's Frozen Adventure", 2017)
INSERT INTO musical_movies VALUES ("Across the Universe", 2007);
INSERT INTO musical_movies VALUES ("Moana", 2016);
INSERT INTO musical_movies VALUES ("Moulin Rouge", 2001);
```

Joining related tables

Related tables

A table is related to another table if two columns describe the same piece of information.

section

id	capacity	staff_id	tag_string
145	35	142	Regular
146	36	188	Zoom
147	36	144	Scholars
148	45	145	Transfer
149	45	174	Regular

user

id	email	name	section_id
192	ana_kerluke@berkeley.edu	Ana Kerluke	149
255	paige_wintheiser@berkeley.edu	Paige Wintheiser	149
270	leanna.feest@berkeley.edu	Leanna Feest	149
387	marcelo35@berkeley.edu	Marcelo Gruno	149
401	baron95@berkeley.edu	Baron Weiss	149

John's dogs

dogs

name	fur
abraham	long
barack	short
clinton	long
delano	long
eisenhower	short
fillmore	curly
grover	short
herbert	curly

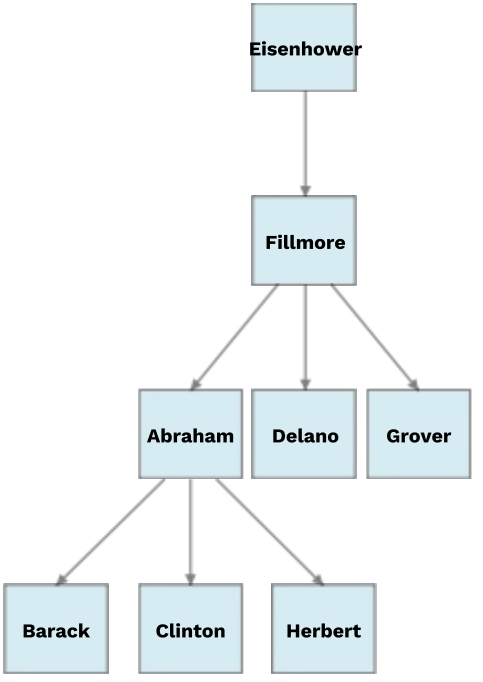
parents

parent	child
abraham	barack
abraham	clinton
delano	herbert
fillmore	abraham
fillmore	delano
fillmore	grover
fillmore	grover
eisenhower	fillmore

Dog family tree (visualized)

parents

parent	child
abraham	barack
abraham	clinton
delano	herbert
fillmore	abraham
fillmore	delano
fillmore	grover
fillmore	grover
eisenhower	fillmore


Eisenhower
Fillmore
Abraham
Delano
Grover
Barack
Clinton
Herbert

Joining related tables

A join on two tables A and B yields all combinations of a row from table A and a row from table B.

Select the parents of curly-furred dogs:

```
SELECT parent FROM parents, dogs
    WHERE child = name AND fur = "curly";
```

Joining a table with itself

Two tables may share a column name (especially when they're the same table!). Dot expressions and aliases disambiguate column values.

Select all pairs of siblings:

```
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;
```

Exercise: Grandparents

Which statement evaluates to all grandparent, grandchild pairs?

A:

```
SELECT a.grandparent, b.child FROM parents AS a, parents AS b
    WHERE b.parent = a.child;
```

B:

```
SELECT a.grandparent, b.child FROM parents AS a, parents AS b
    WHERE a.parent = b.child;
```

C:

```
SELECT a.parent, b.child FROM parents AS a, parents AS b
    WHERE b.parent = a.child;
```

D:

```
SELECT a.parent, b.child FROM parents AS a, parents AS b
    WHERE a.parent = b.child;
```

Exercise: Grandparents

Which statement evaluates to all grandparent, grandchild pairs?

A: ✖

```
SELECT a.grandparent, b.child FROM parents AS a, parents AS b
    WHERE b.parent = a.child;
```

B:

```
SELECT a.grandparent, b.child FROM parents AS a, parents AS b
    WHERE a.parent = b.child;
```

C:

```
SELECT a.parent, b.child FROM parents AS a, parents AS b
    WHERE b.parent = a.child;
```

D:

```
SELECT a.parent, b.child FROM parents AS a, parents AS b
    WHERE a.parent = b.child;
```

Exercise: Grandparents

Which statement evaluates to all grandparent, grandchild pairs?

A: ✖

```
SELECT a.grandparent, b.child FROM parents AS a, parents AS b
    WHERE b.parent = a.child;
```

B: ✖

```
SELECT a.grandparent, b.child FROM parents AS a, parents AS b
    WHERE a.parent = b.child;
```

C:

```
SELECT a.parent, b.child FROM parents AS a, parents AS b
    WHERE b.parent = a.child;
```

D:

```
SELECT a.parent, b.child FROM parents AS a, parents AS b
    WHERE a.parent = b.child;
```

Exercise: Grandparents

Which statement evaluates to all grandparent, grandchild pairs?

A: ✗

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SELECT a.grandparent, b.child FROM parents AS a, parents AS b
    WHERE b.parent = a.child;
```

B: ✗

```
SELECT a.grandparent, b.child FROM parents AS a, parents AS b
    WHERE a.parent = b.child;
```

C: ✓

```
SELECT a.parent, b.child FROM parents AS a, parents AS b
    WHERE b.parent = a.child;
```

D:

```
SELECT a.parent, b.child FROM parents AS a, parents AS b
    WHERE a.parent = b.child;
```

Exercise: Grandparents

Which statement evaluates to all grandparent, grandchild pairs?

A: ✗

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SELECT a.grandparent, b.child FROM parents AS a, parents AS b
    WHERE b.parent = a.child;
```

B: ✗

```
SELECT a.grandparent, b.child FROM parents AS a, parents AS b
    WHERE a.parent = b.child;
```

C: ✓

```
SELECT a.parent, b.child FROM parents AS a, parents AS b
    WHERE b.parent = a.child;
```

D: ✗

```
SELECT a.parent, b.child FROM parents AS a, parents AS b
    WHERE a.parent = b.child;
```

Joining more than 2 tables

Starting with this table...

```
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 style as their grandchildren:

Joining more than 2 tables

Starting with this table...

```
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 style as their grandchildren:

```
SELECT grandog FROM grandparents, dogs AS c, dogs AS d
    WHERE grandog = c.name AND
    granpup = d.name AND
    c.fur = d.fur;
```

Exercise: 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.

Expected output:

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

Expressions

Numerical expressions

Multiple parts of a `SELECT` statement can include an **expr**ession.

```
SELECT [result-column] FROM [table] WHERE [expr];
```

`result-column` can expand to either `expr` AS `column-alias` or `*`.

Expressions can contain function calls and arithmetic operators.

- Combine values: `+`, `-`, `*`, `/`, `%`, `and`, `or`
- Transform values: `ABS()`, `ROUND()`, `NOT`, `-`
- Compare values: `<`, `<=`, `>`, `>=`, `<>`, `!=`, `=`

See all the possibilities for expressions.

String expressions

The `||` operator does string concatenation:

```
SELECT (views || "M") as total_views FROM songs;
```

There are basic functions for string manipulation as well:

```
SELECT SUBSTR(release_year, 3, 2) AS two_digit_year
   FROM songs ORDER BY two_digit_year;
```