

SQL

Announcements

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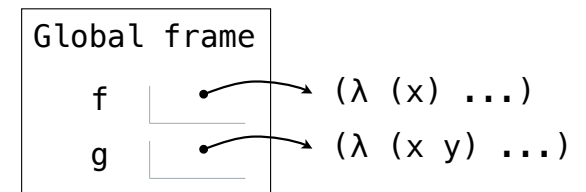
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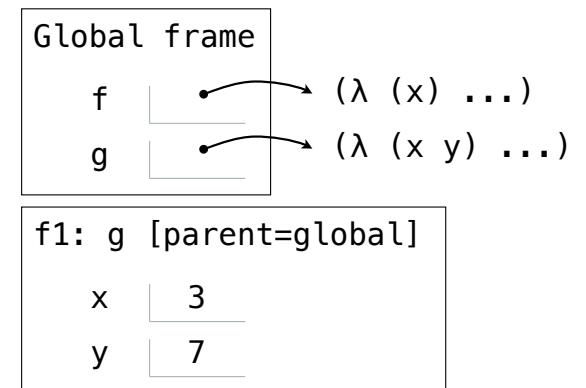
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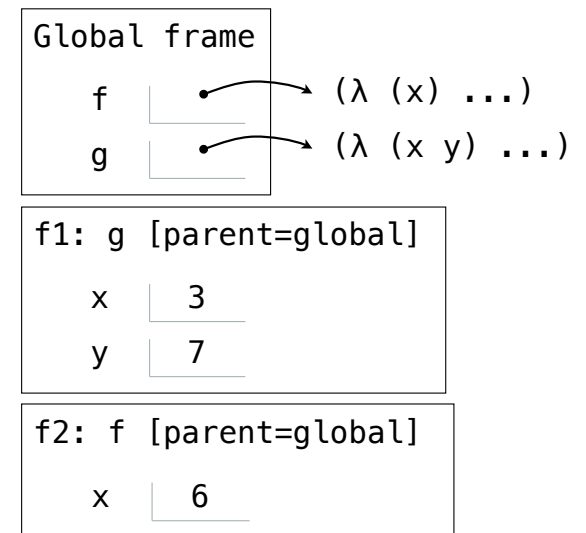
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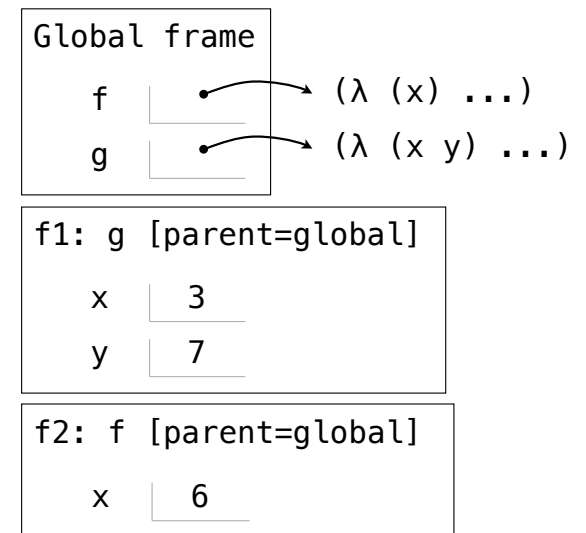
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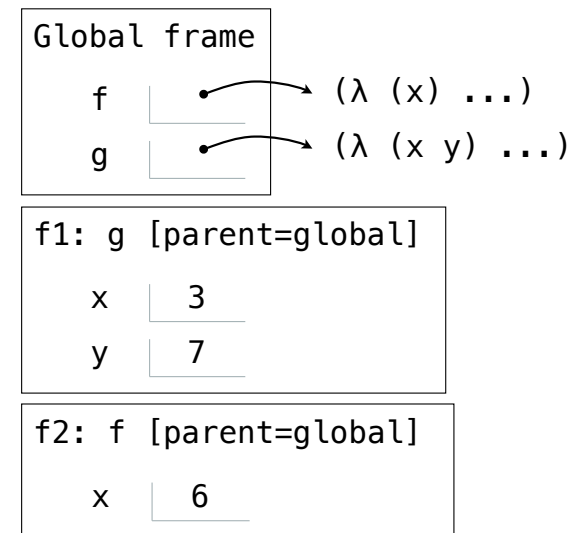
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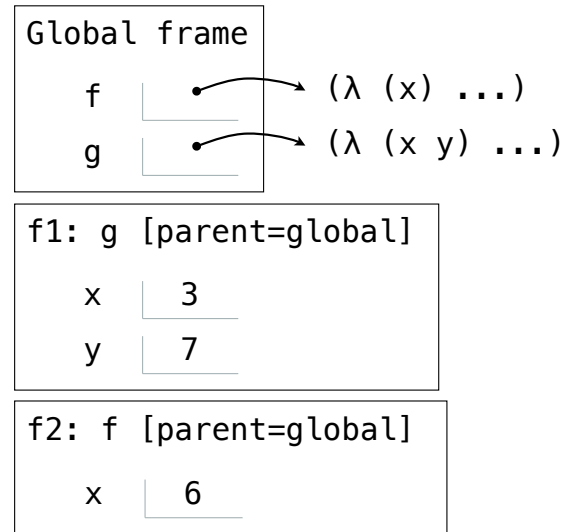
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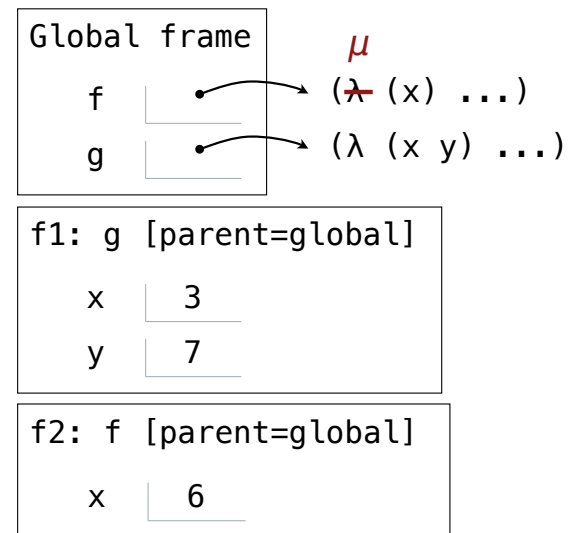
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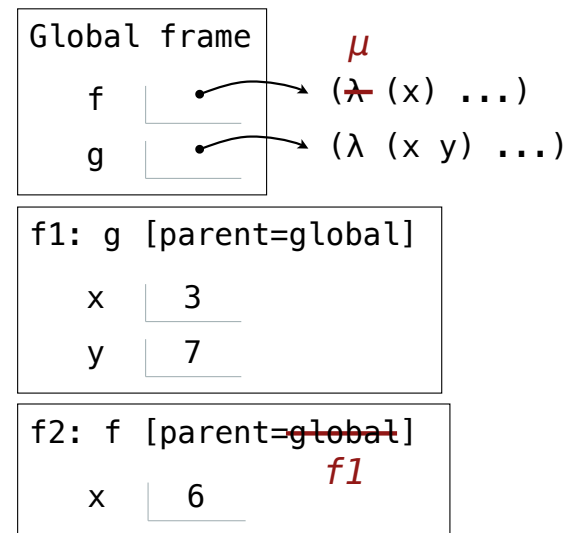
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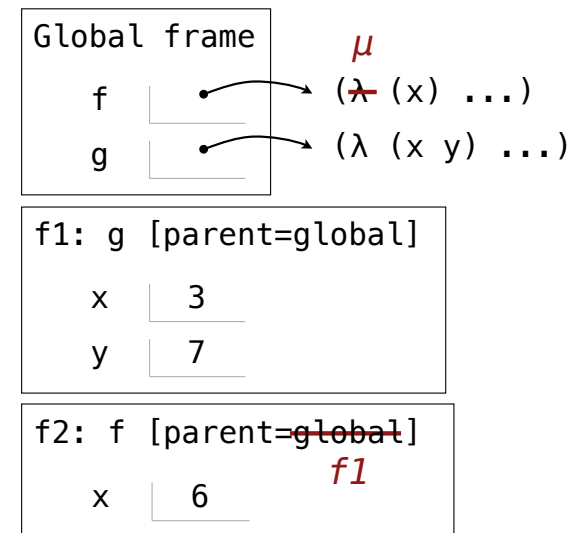
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Databases

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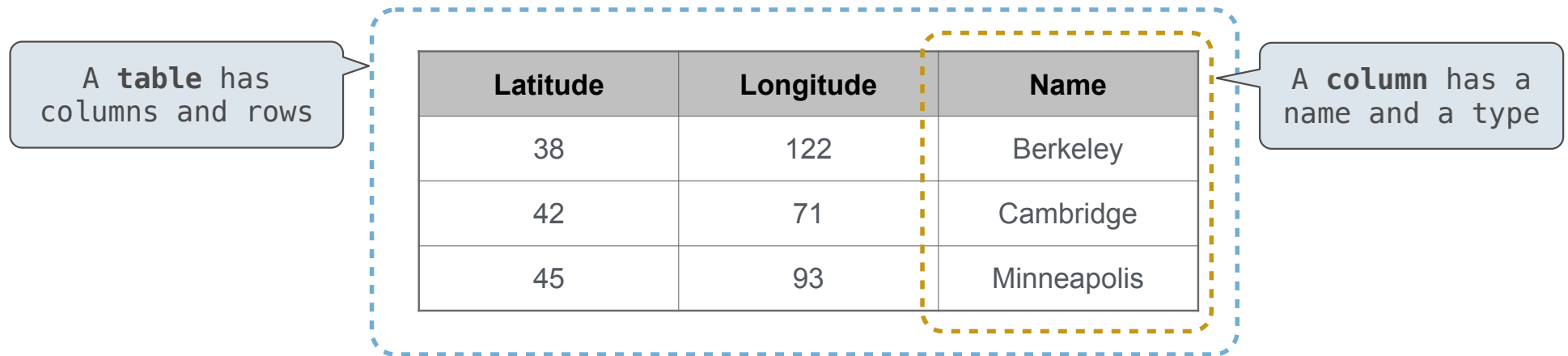
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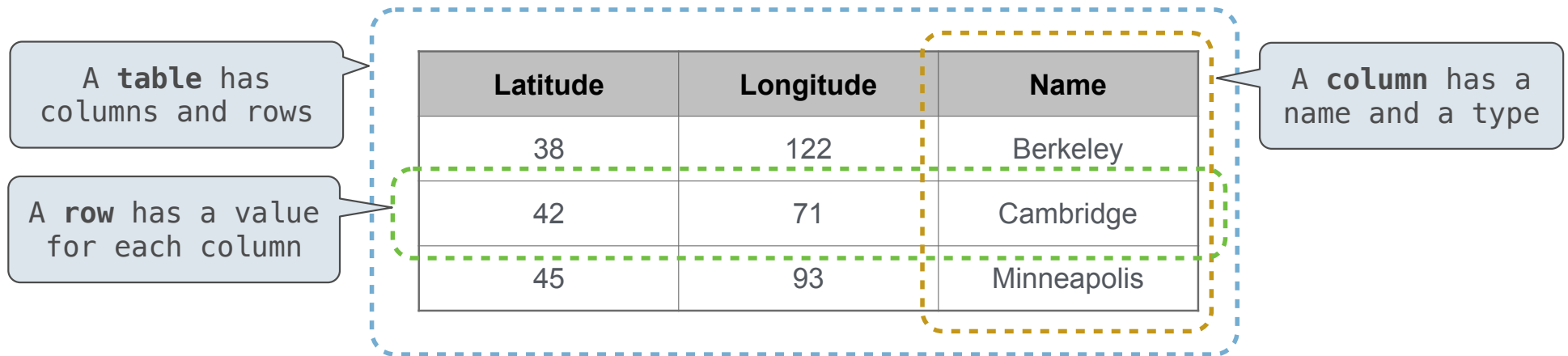
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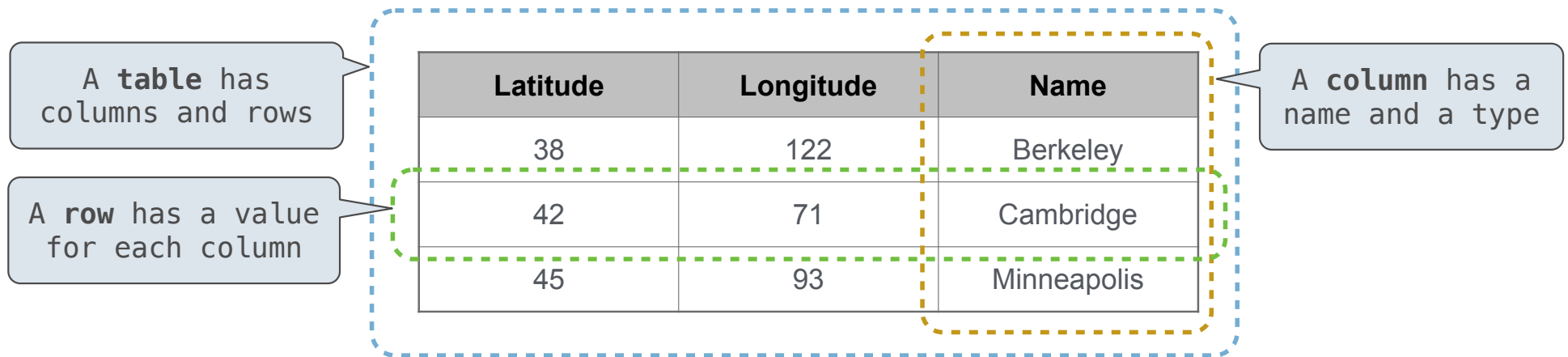
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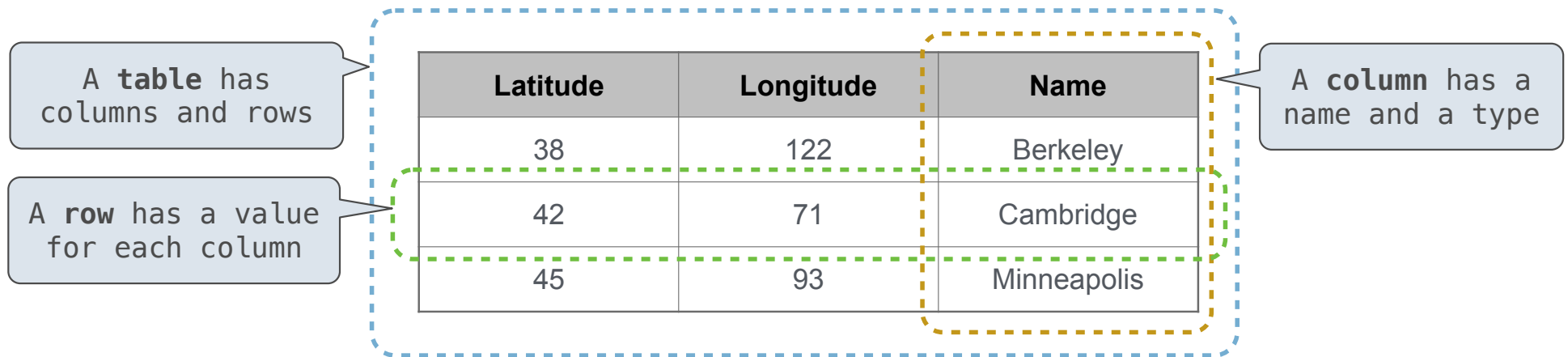


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`create table cities as`

`select 38 as latitude, 122 as longitude, "Berkeley" as name union`

Cities:

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Structured Query Language (SQL)

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Getting Started with SQL

Install sqlite (version 3.8.3 or later): <http://sqlite.org/download.html>

Use sqlite online: code.cs61a.org/sql

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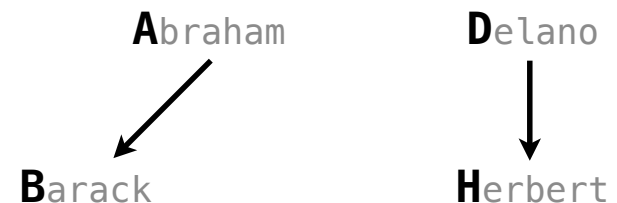
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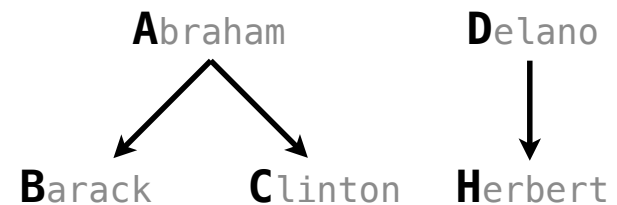
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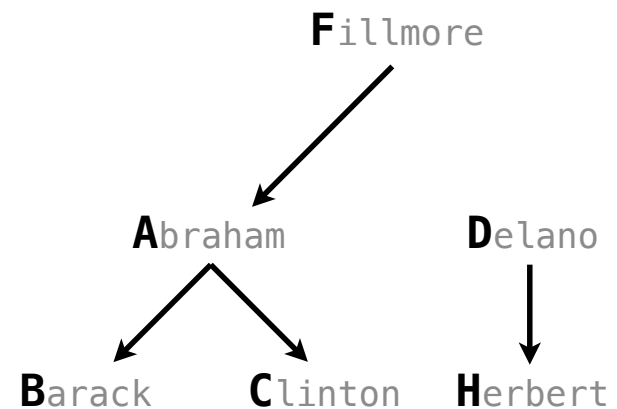
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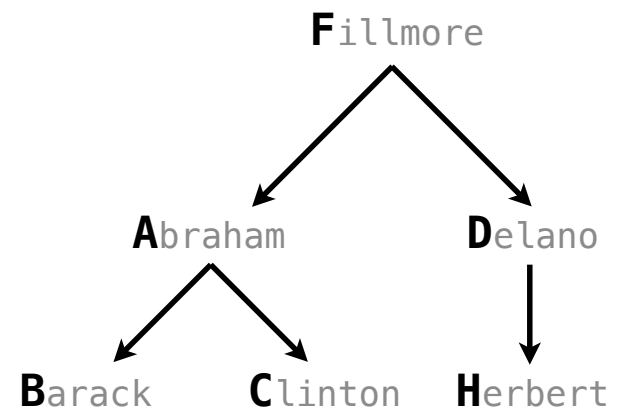
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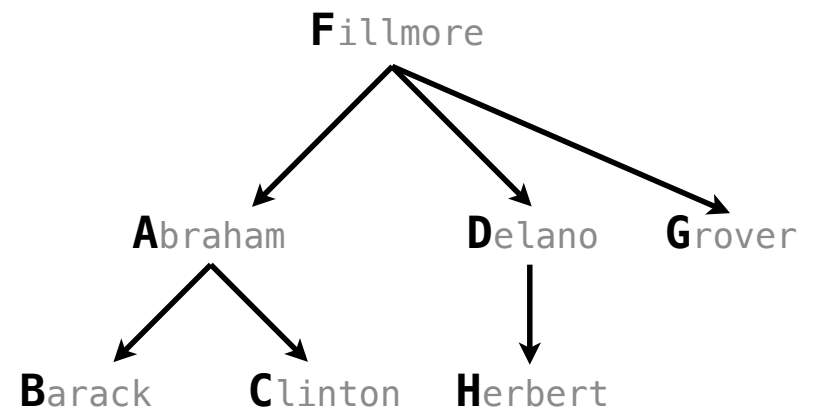
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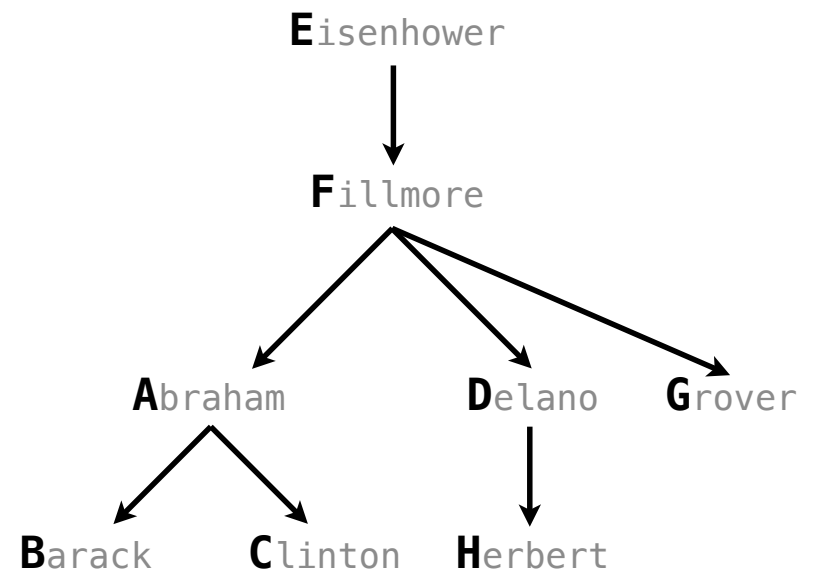
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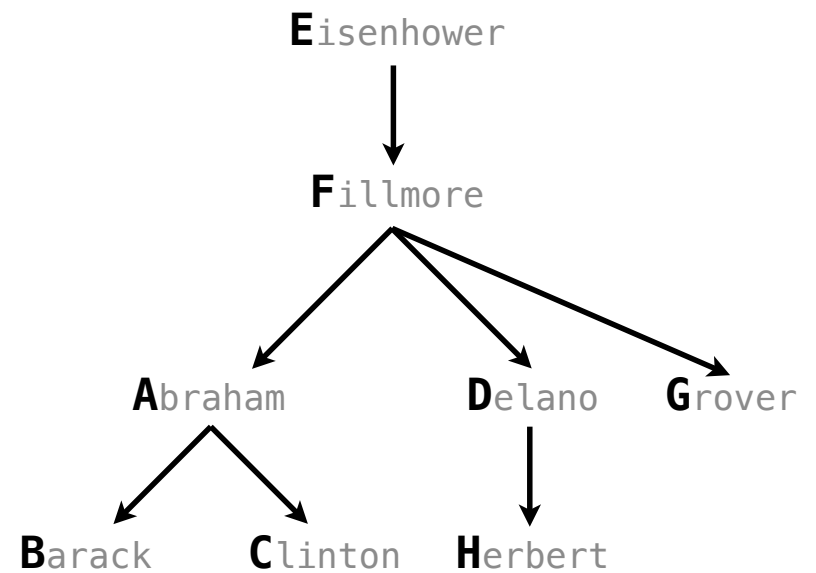
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select "fillmore"     , "delano"      union
select "fillmore"     , "grover"      union
select "eisenhower"   , "fillmore";
```



Naming Tables

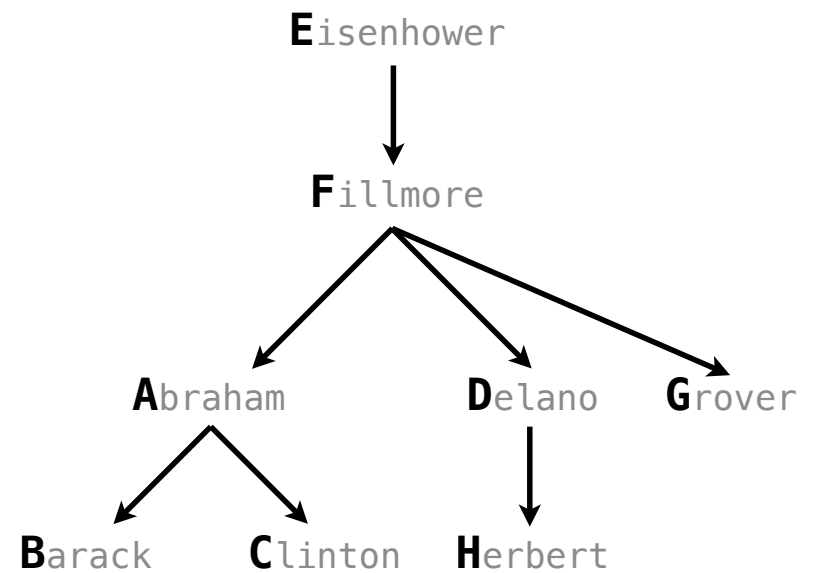
```
select "delano" as parent, "herbert" as child union
select "abraham"      , "barack"      union
select "abraham"      , "clinton"     union
select "fillmore"     , "abraham"     union
select "fillmore"     , "delano"      union
select "fillmore"     , "grover"      union
select "eisenhower"   , "fillmore";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



Naming Tables

SQL is often used as an interactive language

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

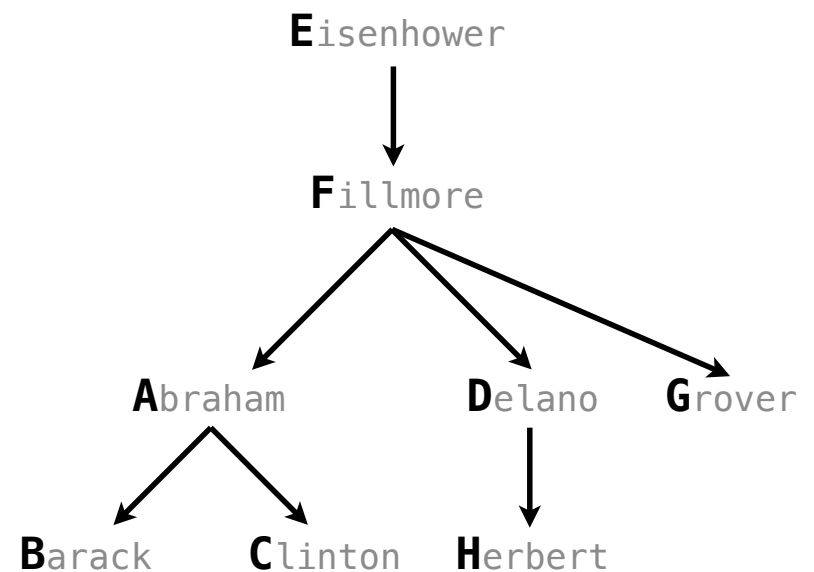


Naming Tables

SQL is often used as an interactive language

The result of a **select** statement is displayed to the user, but not stored

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



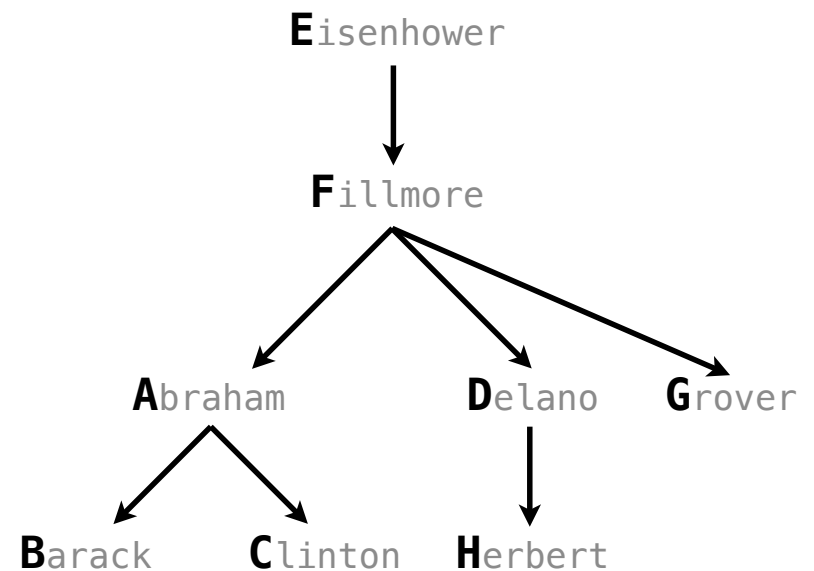
Naming Tables

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The result of a **select** statement is displayed to the user, but not stored

A **create table** statement gives the result a name

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select "abraham"      , "clinton"    union
select "fillmore"     , "abraham"    union
select "fillmore"     , "delano"     union
select "fillmore"     , "grover"     union
select "eisenhower"   , "fillmore";
```



Naming Tables

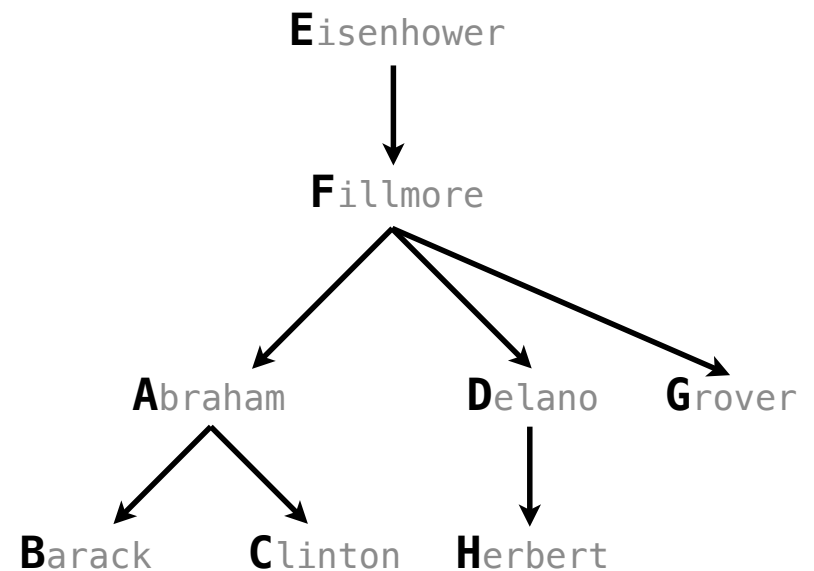
SQL is often used as an interactive language

The result of a **select** statement is displayed to the user, but not stored

A **create table** statement gives the result a name

```
create table [name] as [select statement];
```

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



Naming Tables

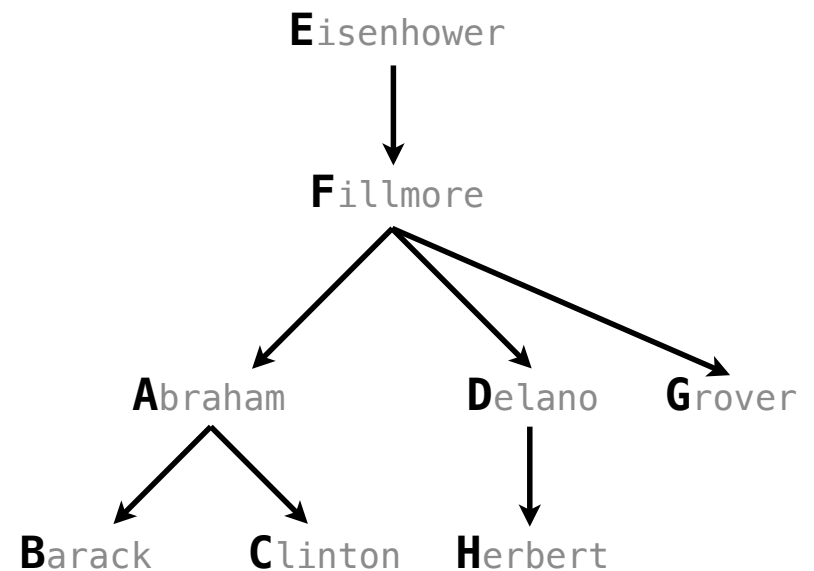
SQL is often used as an interactive language

The result of a **select** statement is displayed to the user, but not stored

A **create table** statement gives the result a name

```
create table [name] as [select statement];
```

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



Naming Tables

SQL is often used as an interactive language

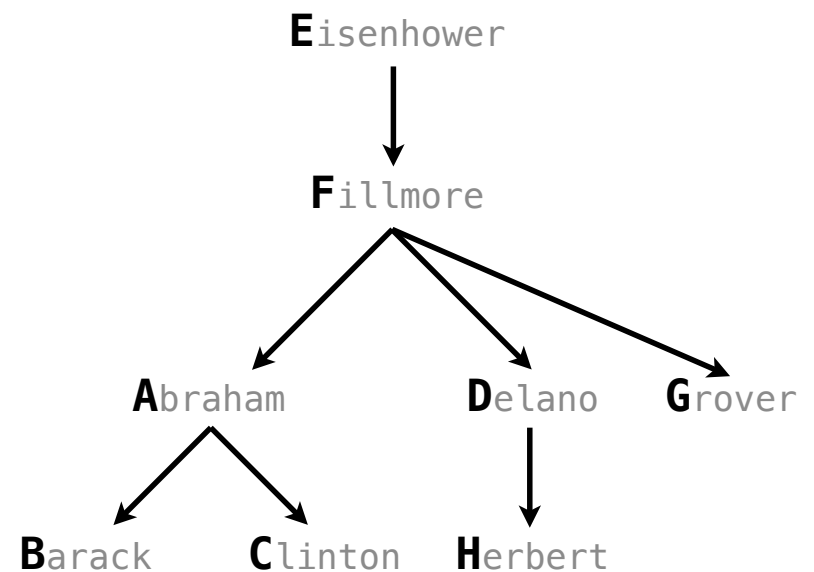
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```
create table [name] as [select statement];
```

```
create table parents as
```

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



Naming Tables

SQL is often used as an interactive language

The result of a **select** statement is displayed to the user, but not stored

A **create table** statement gives the result a name

```
create table [name] as [select statement];
```

```
create table parents as
```

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

Parents:

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

Projecting Tables

Select Statements Project Existing Tables

Select Statements Project Existing Tables

A **select** statement can specify an input table using a **from** clause

Select Statements Project Existing Tables

A **select** statement can specify an input table using a **from** clause

```
select [expression] as [name], [expression] as [name], ... ;
```

Select Statements Project Existing Tables

A **select** statement can specify an input table using a **from** clause

```
select [expression] as [name], [expression] as [name], ... ;  
select [columns] ;
```

Select Statements Project Existing Tables

A **select** statement can specify an input table using a **from** clause

```
select [expression] as [name], [expression] as [name], ... ;  
select [columns] from [table] ;
```

Select Statements Project Existing Tables

A **select** statement can specify an input table using a **from** clause

A subset of the rows of the input table can be selected using a **where** clause

```
select [expression] as [name], [expression] as [name], ... ;  
select [columns] from [table] ;
```

Select Statements Project Existing Tables

A **select** statement can specify an input table using a **from** clause

A subset of the rows of the input table can be selected using a **where** clause

```
select [expression] as [name], [expression] as [name], ... ;  
select [columns] from [table] where [condition] ;
```

Select Statements Project Existing Tables

A **select** statement can specify an input table using a **from** clause

A subset of the rows of the input table can be selected using a **where** clause

An ordering over the remaining rows can be declared using an **order by** clause

```
select [expression] as [name], [expression] as [name], ... ;  
select [columns] from [table] where [condition] ;
```

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


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A **select** statement can specify an input table using a **from** clause

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An ordering over the remaining rows can be declared using an **order by** clause

Column descriptions determine how each input row is projected to a result row

```
select [expression] as [name], [expression] as [name], ... ;
```

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

Select Statements Project Existing Tables

A **select** statement can specify an input table using a **from** clause

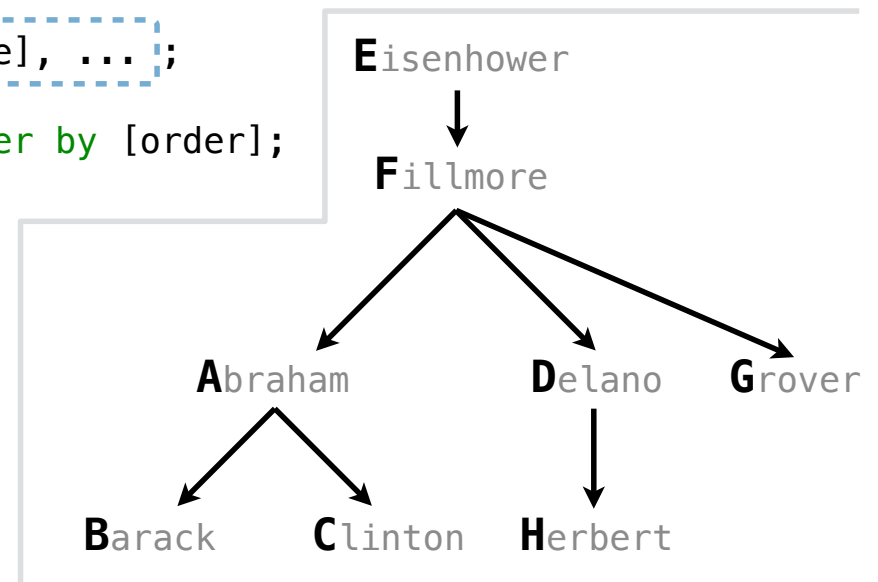
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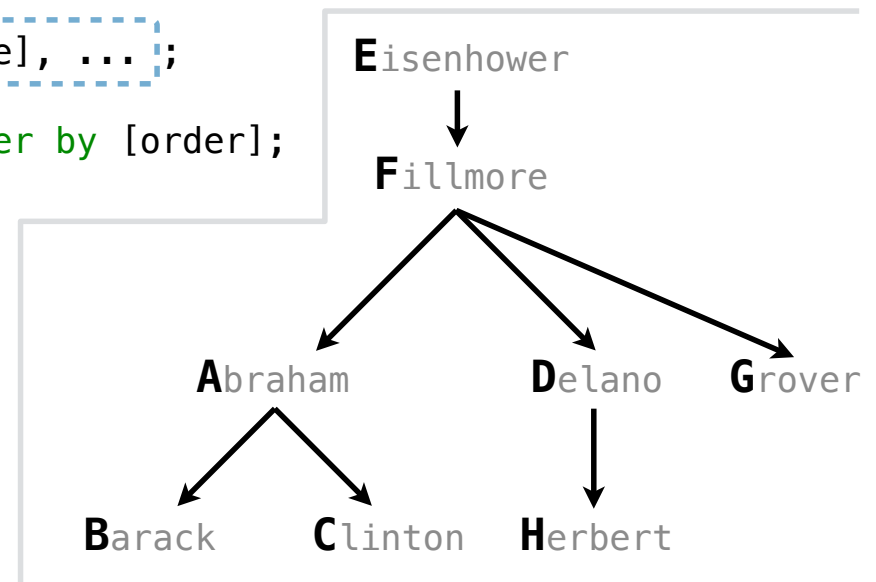
An ordering over the remaining rows can be declared using an **order by** clause

Column descriptions determine how each input row is projected to a result row

```
select [expression] as [name], [expression] as [name], ... ;
```

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

```
select child from parents where parent = "abraham";
```



Select Statements Project Existing Tables

A **select** statement can specify an input table using a **from** clause

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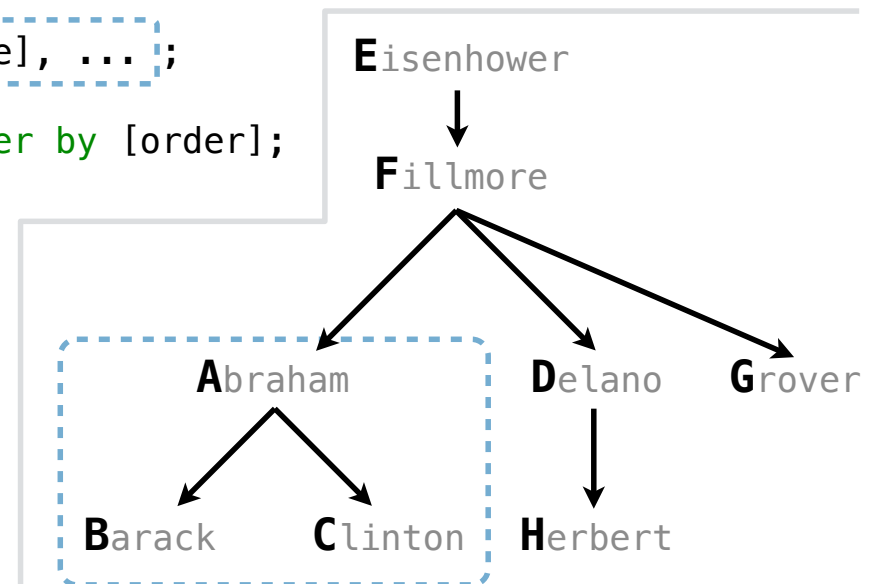
An ordering over the remaining rows can be declared using an **order by** clause

Column descriptions determine how each input row is projected to a result row

```
select [expression] as [name], [expression] as [name], ... ;
```

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

```
select child from parents where parent = "abraham";
```



Select Statements Project Existing Tables

A **select** statement can specify an input table using a **from** clause

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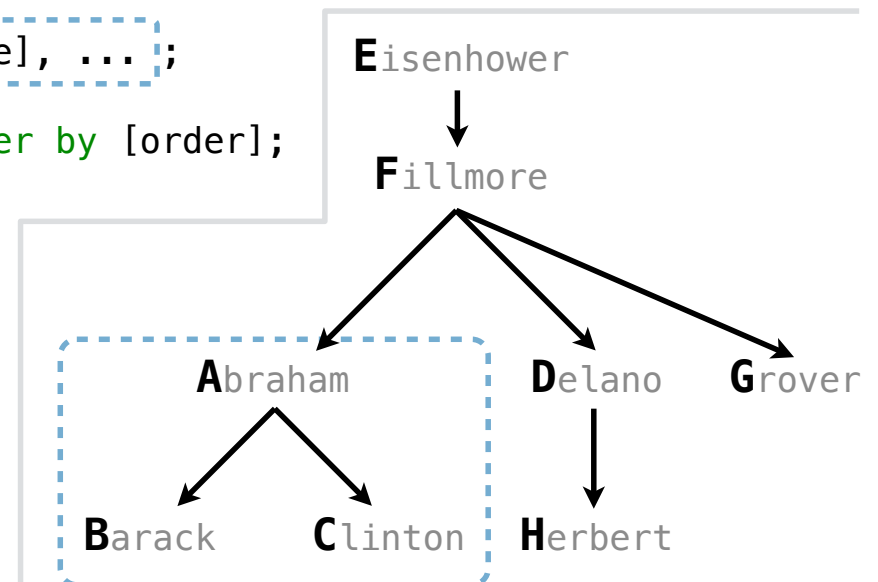
Column descriptions determine how each input row is projected to a result row

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select [expression] as [name], [expression] as [name], ... ;
```

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

```
select child from parents where parent = "abraham";
```

child
barack
clinton



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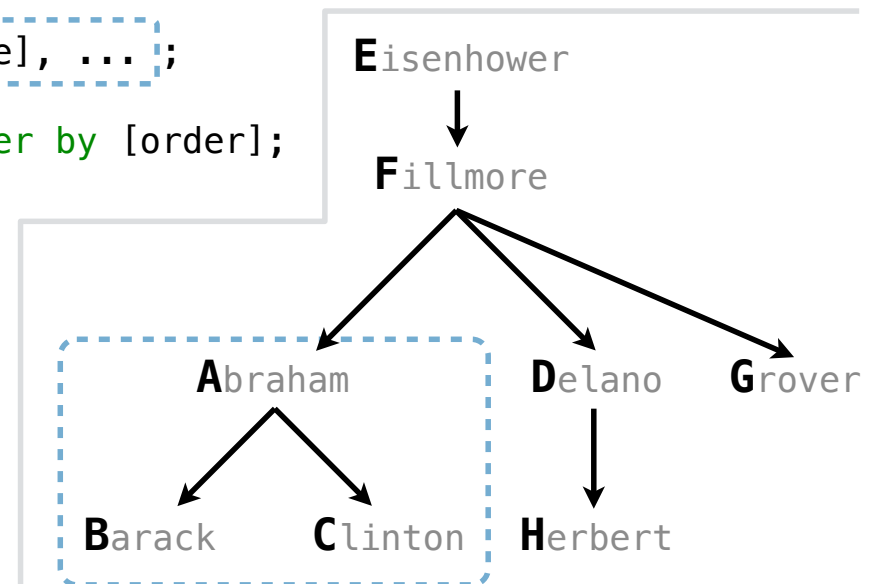
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select [expression] as [name], [expression] as [name], ... ;
```

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select [columns] from [table] where [condition] order by [order];
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```
select child from parents where parent = "abraham";
```

```
select parent from parents where parent > child;
```

child
barack
clinton



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```

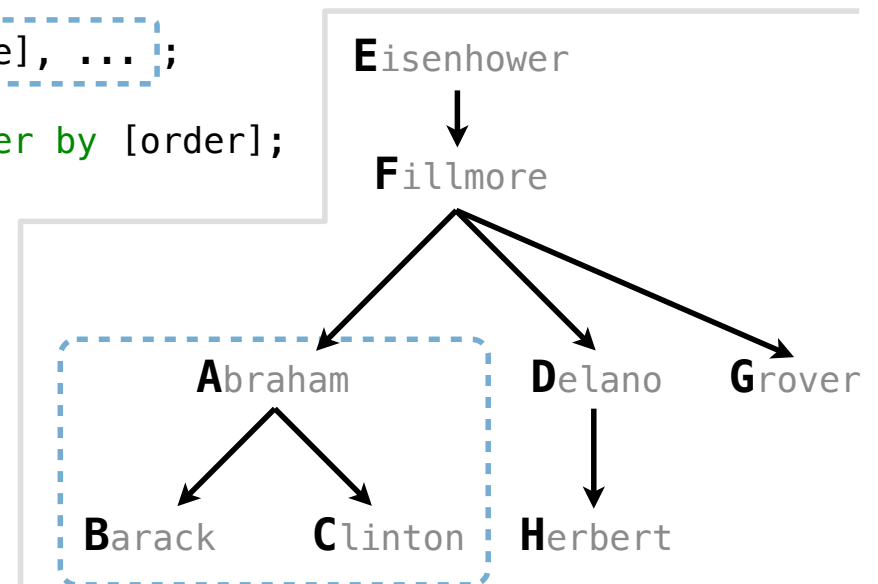
```
select [columns] from [table] where [condition] order by [order];
```

```
select child from parents where parent = "abraham";
```

```
select parent from parents where parent > child;
```

child
barack
clinton

parent
fillmore
fillmore



Select Statements Project Existing Tables

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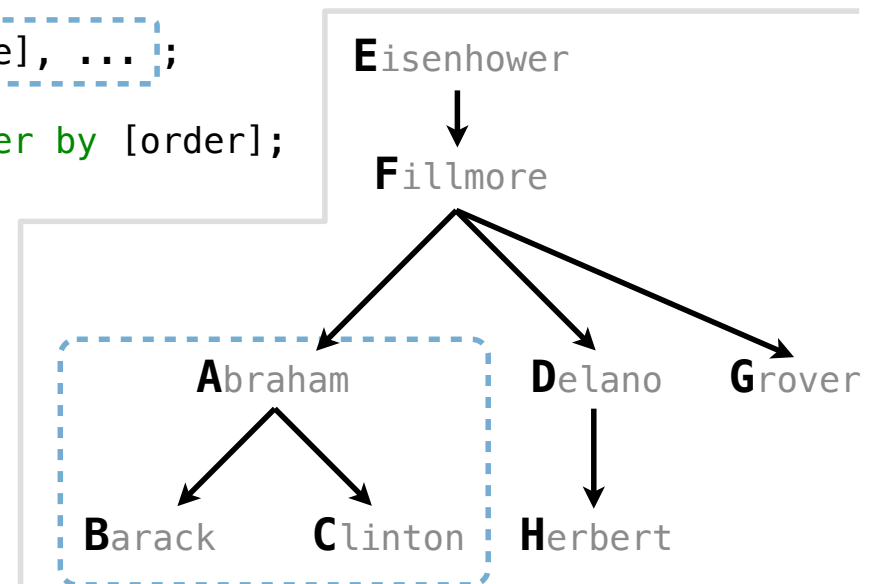
```
select child from parents where parent = "abraham";
```

```
select parent from parents where parent > child;
```

child
barack
clinton

parent
fillmore
fillmore

(Demo)



Arithmetic

Arithmetic in Select Expressions

Arithmetic in Select Expressions

In a select expression, column names evaluate to row values

Arithmetic expressions can combine row values and constants

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Arithmetic in Select Expressions

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```
create table lift as
  select 101 as chair, 2 as single, 2 as couple union
  select 102          , 0          , 3          union
  select 103          , 4          , 1;
```

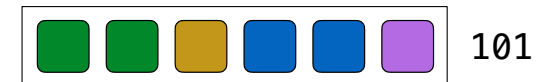


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```

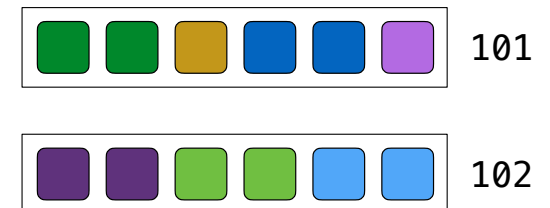


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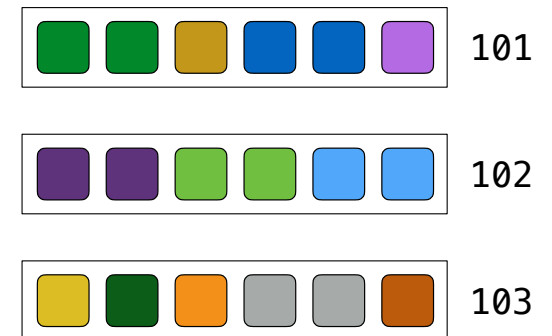


Arithmetic in Select Expressions

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```



Arithmetic in Select Expressions



















In a select expression, column names evaluate to row values

Arithmetic expressions can combine row values and constants

```
create table lift as
  select 101 as chair, 2 as single, 2 as couple union
  select 102          , 0          , 3          union
  select 103          , 4          , 1;
```

```
select chair, single + 2 * couple as total from lift;
```



						101
						102
						103

Arithmetic in Select Expressions

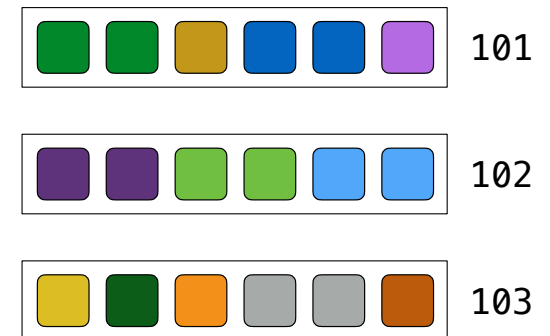
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  select 101 as chair, 2 as single, 2 as couple union
  select 102          , 0          , 3          union
  select 103          , 4          , 1;
```

```
select chair, single + 2 * couple as total from lift;
```

chair	total
101	6
102	6
103	6



Discussion Question

Given the table **ints** that describes how to sum powers of 2 to form various integers

```
create table ints as
  select "zero" as word, 0 as one, 0 as two, 0 as four, 0 as eight union
  select "one"      , 1      , 0      , 0      , 0      union
  select "two"      , 0      , 2      , 0      , 0      union
  select "three"    , 1      , 2      , 0      , 0      union
  select "four"     , 0      , 0      , 4      , 0      union
  select "five"     , 1      , 0      , 4      , 0      union
  select "six"      , 0      , 2      , 4      , 0      union
  select "seven"    , 1      , 2      , 4      , 0      union
  select "eight"    , 0      , 0      , 0      , 8      union
  select "nine"     , 1      , 0      , 0      , 8;
```

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  select "four"     , 0      , 0      , 4      , 0      union
  select "five"     , 1      , 0      , 4      , 0      union
  select "six"      , 0      , 2      , 4      , 0      union
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  select "eight"    , 0      , 0      , 0      , 8      union
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```

(A) Write a select statement for a two-column table of the **word** and **value** for each integer

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  select "nine"     , 1      , 0      , 0      , 8;
```

(A) Write a select statement for a two-column table of the `word` and `value` for each integer

word	value
zero	0
one	1
two	2
three	3
...	...

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  select "eight"    , 0      , 0      , 0      , 8      union
  select "nine"     , 1      , 0      , 0      , 8;
```

(A) Write a select statement for a two-column table of the `word` and `value` for each integer

word	value
zero	0
one	1
two	2
three	3
...	...

(B) Write a select statement for the `word` names of the powers of two

Discussion Question

Given the table `ints` that describes how to sum powers of 2 to form various integers

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  select "two"      , 0      , 2      , 0      , 0      union
  select "three"    , 1      , 2      , 0      , 0      union
  select "four"     , 0      , 0      , 4      , 0      union
  select "five"     , 1      , 0      , 4      , 0      union
  select "six"      , 0      , 2      , 4      , 0      union
  select "seven"    , 1      , 2      , 4      , 0      union
  select "eight"    , 0      , 0      , 0      , 8      union
  select "nine"     , 1      , 0      , 0      , 8;
```

(A) Write a select statement for a two-column table of the `word` and `value` for each integer

word	value
zero	0
one	1
two	2
three	3
...	...

(B) Write a select statement for the `word` names of the powers of two

word
one
two
four
eight

Discussion Question

Given the table `ints` that describes how to sum powers of 2 to form various integers

```
create table ints as
  select "zero" as word, 0 as one, 0 as two, 0 as four, 0 as eight union
  select "one"      , 1      , 0      , 0      , 0      union
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  select "three"    , 1      , 2      , 0      , 0      union
  select "four"     , 0      , 0      , 4      , 0      union
  select "five"     , 1      , 0      , 4      , 0      union
  select "six"      , 0      , 2      , 4      , 0      union
  select "seven"    , 1      , 2      , 4      , 0      union
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(A) Write a select statement for a two-column table of the `word` and `value` for each integer

word	value
zero	0
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three	3

...

...

(Demo)

(B) Write a select statement for the `word` names of the powers of two

word
one
two
four
eight