Declarative Programming

Announcements

Declarative Languages

Database Management Systems

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A **table** has columns and rows

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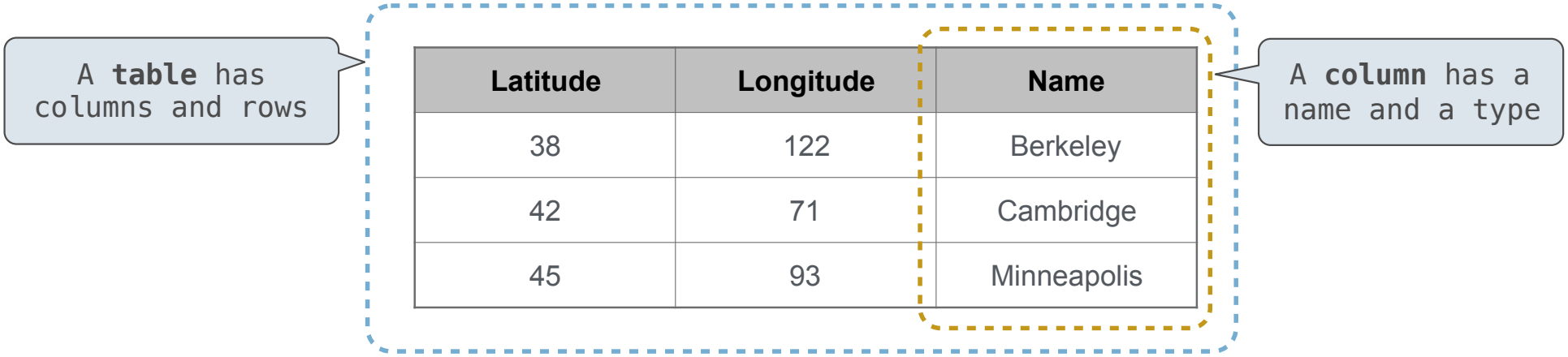

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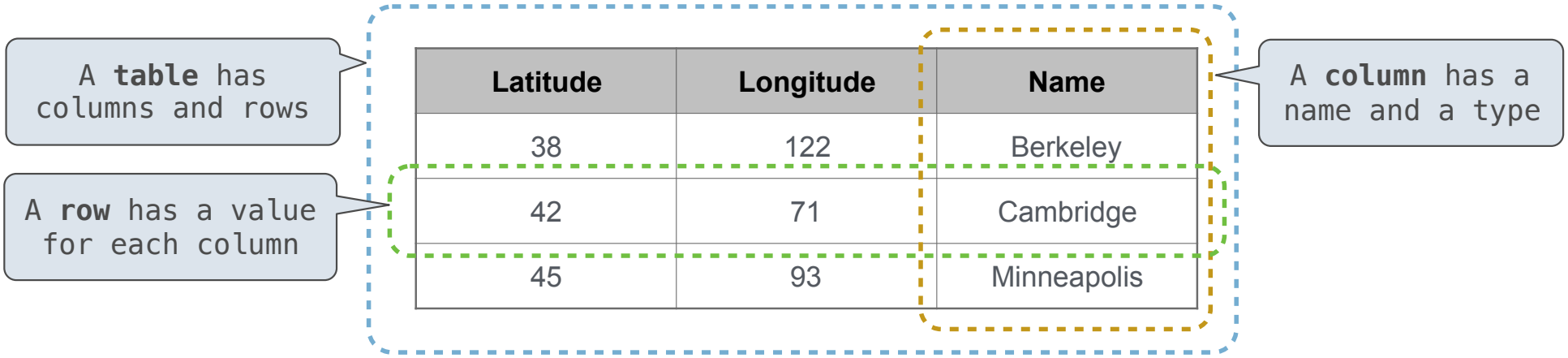

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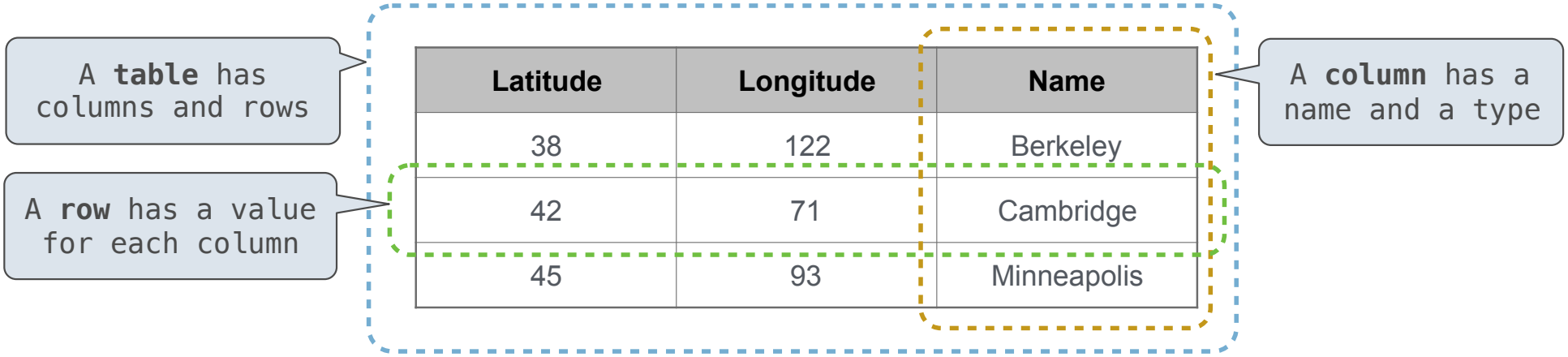

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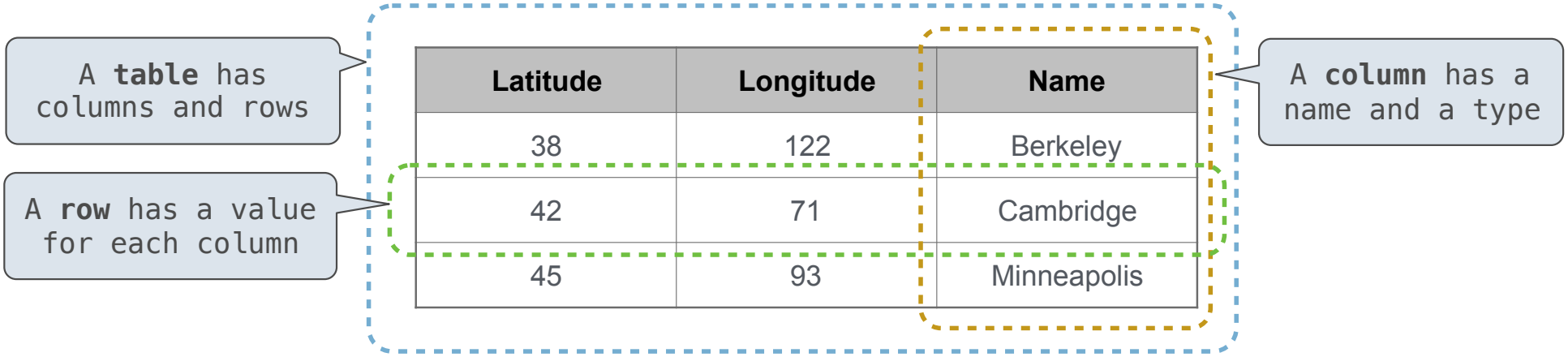

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SQL is a *declarative* programming language

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region	name
west coast	Berkeley
other	Minneapolis
other	Cambridge

Structured Query Language (SQL)

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Today's theme:

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Today's theme:

http://awhimsicalbohemian.typepad.com/.a/6a00e5538b84f3883301538dfa8f19970b-800wi

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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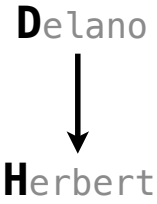

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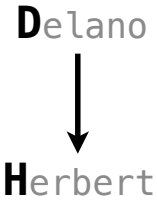

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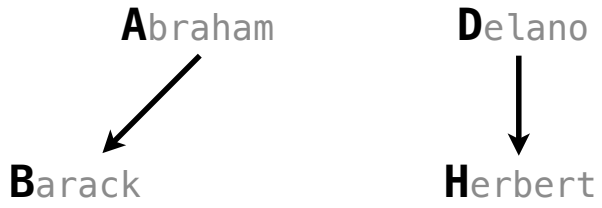

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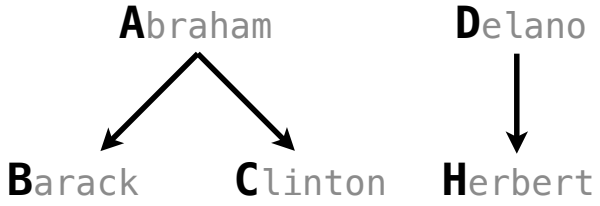

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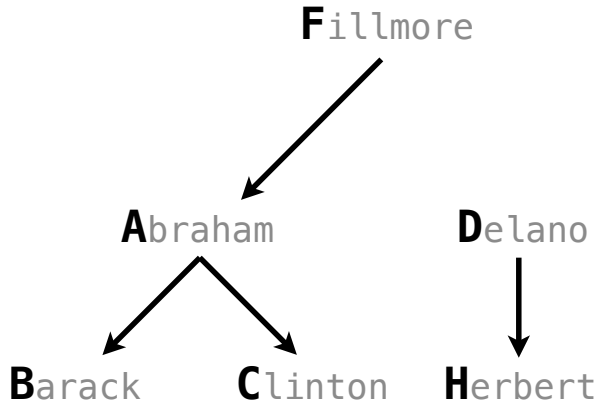

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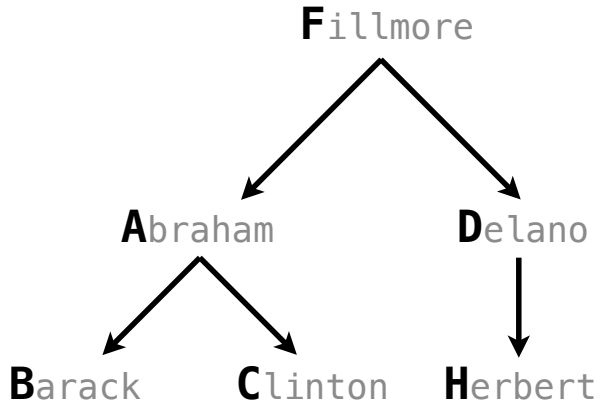

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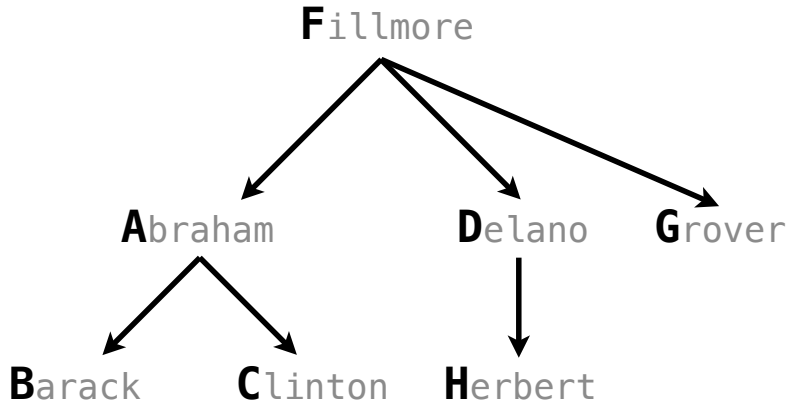

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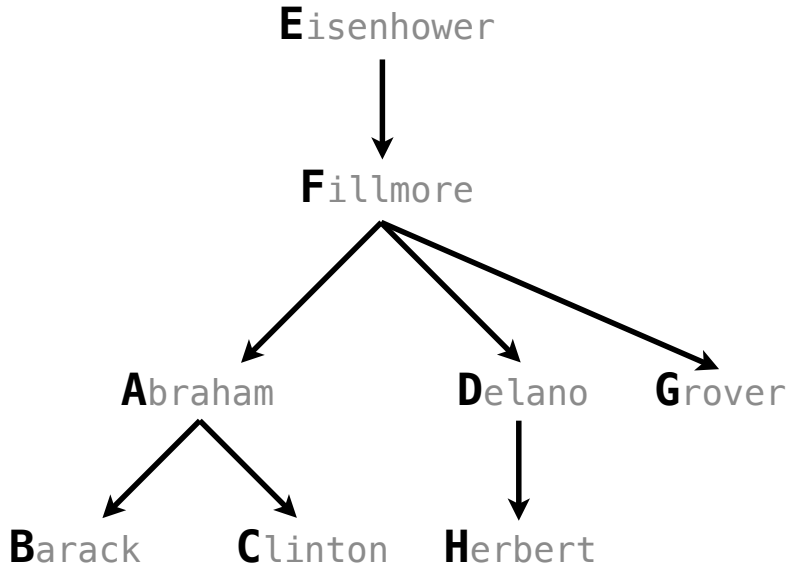

Naming Tables

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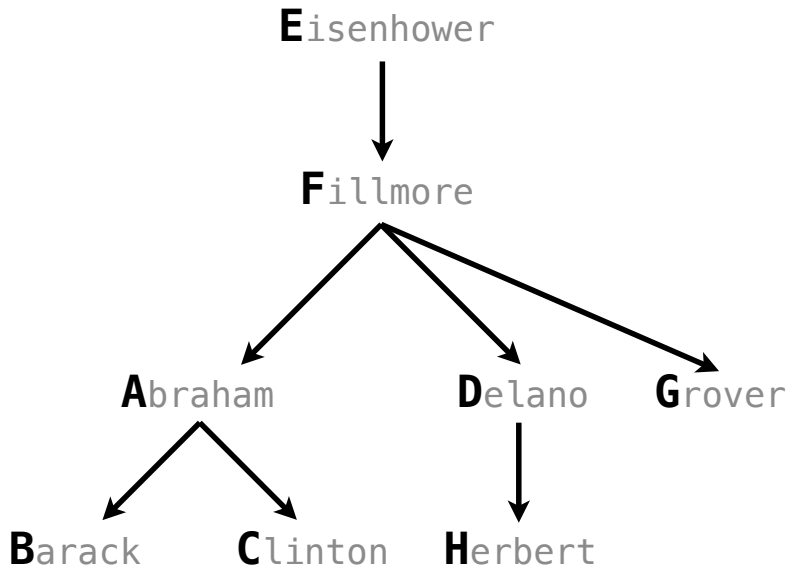

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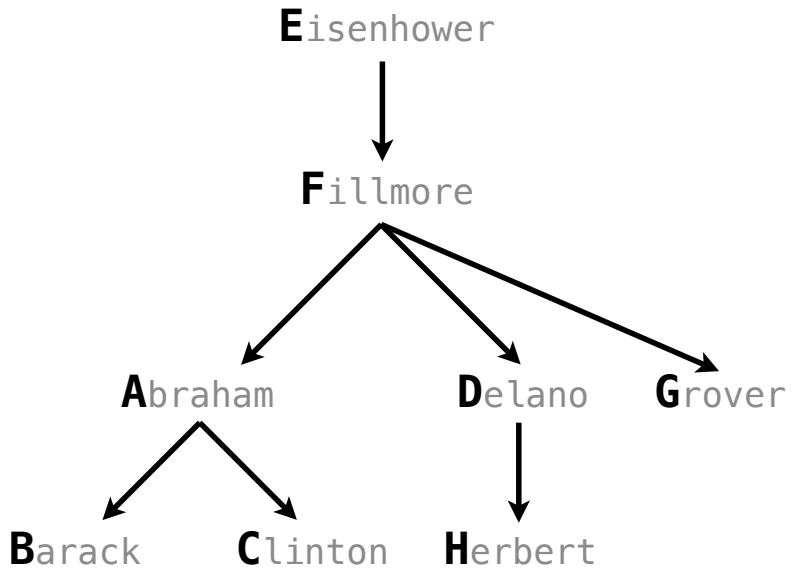

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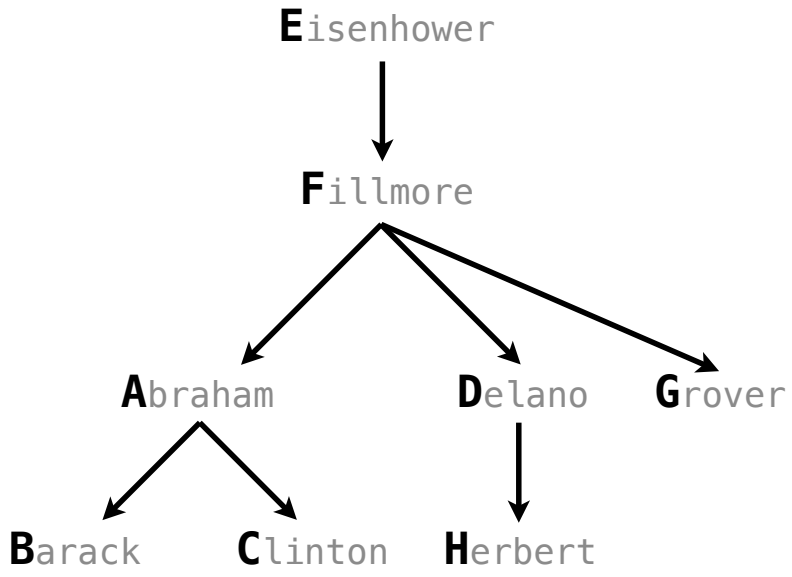

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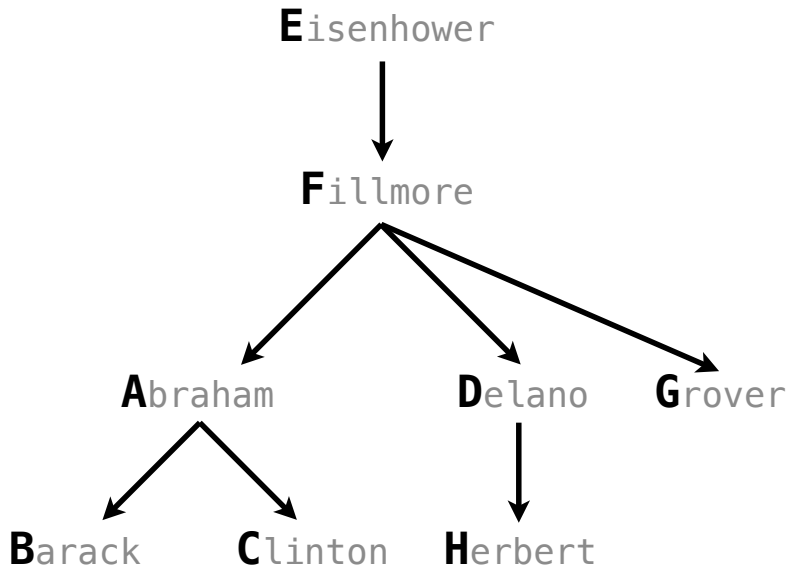

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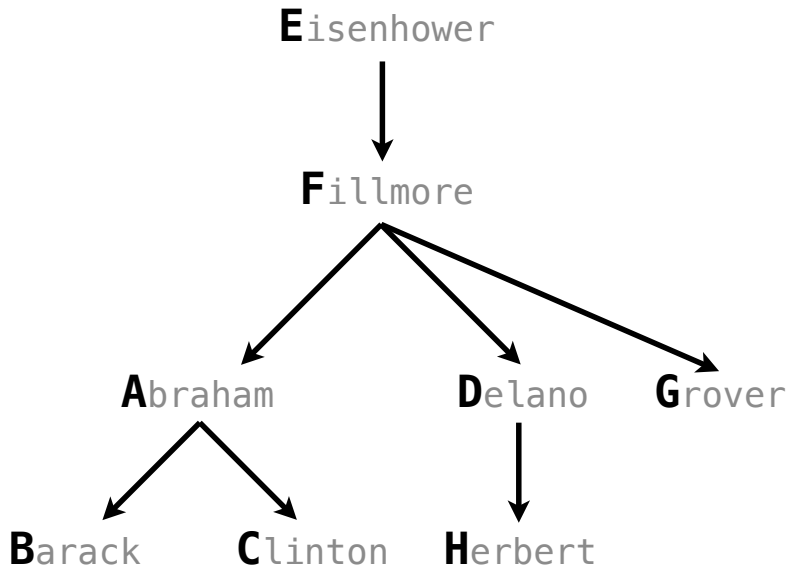

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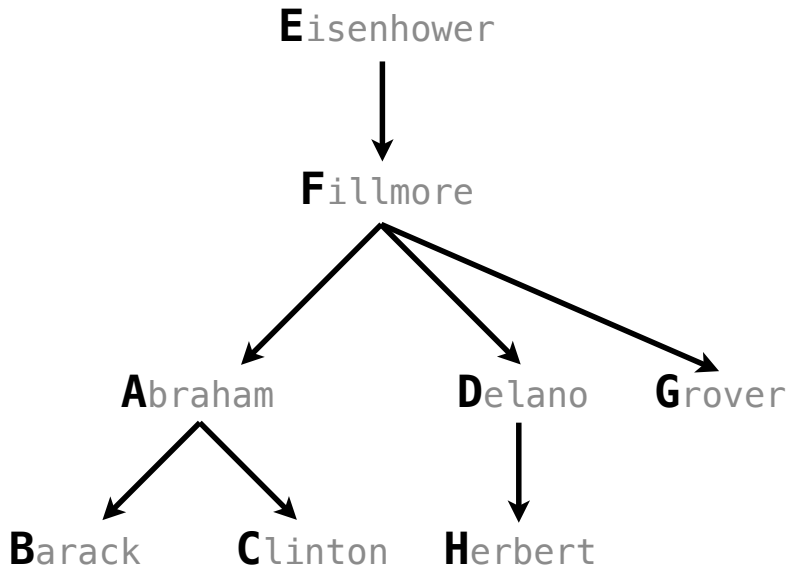

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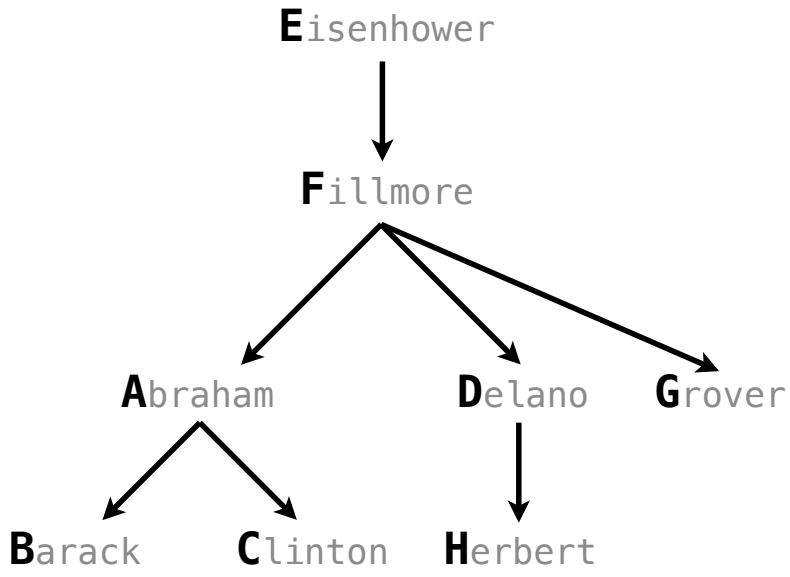

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Parents:

Parent	Child
abraham	barack
abraham	clinton
delano	herbert
fillmore	abraham
fillmore	delano
fillmore	grover
eisenhower	fillmore

Projecting Tables

Select Statements Project Existing Tables

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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

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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

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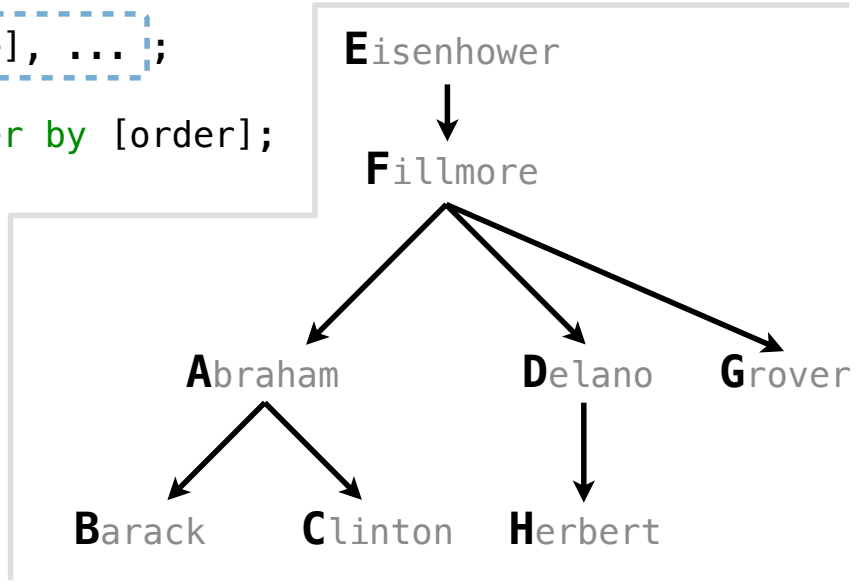

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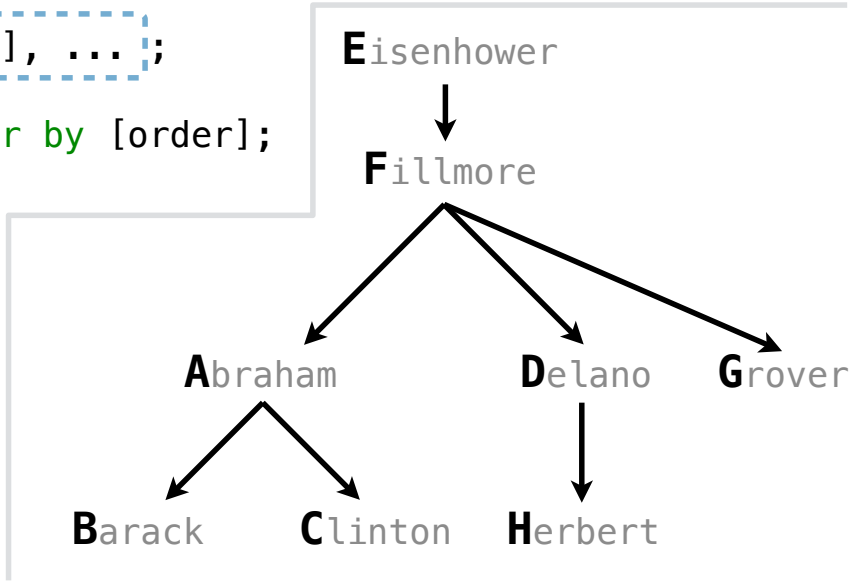
```
select child from parents where parent = "abraham";
```



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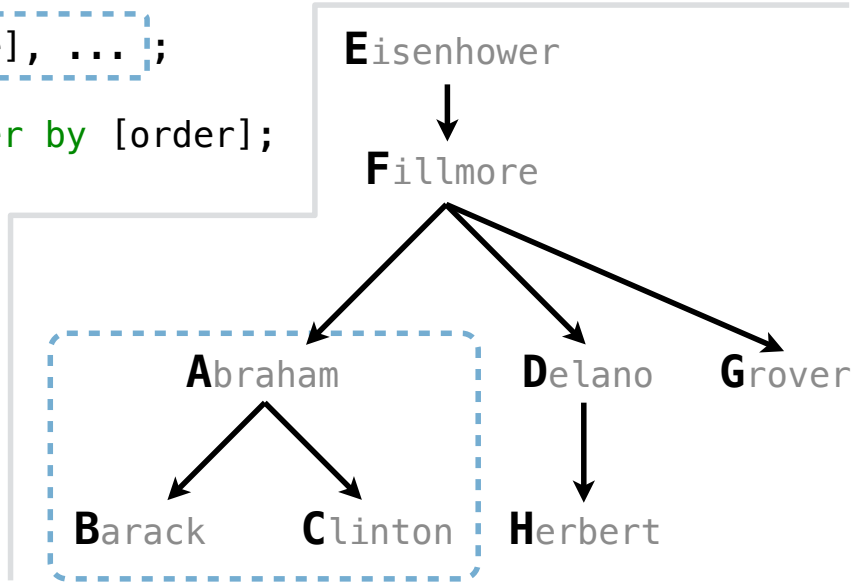

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select [columns] from [table] where [condition] order by [order];
select child from parents where parent = "abraham";
```
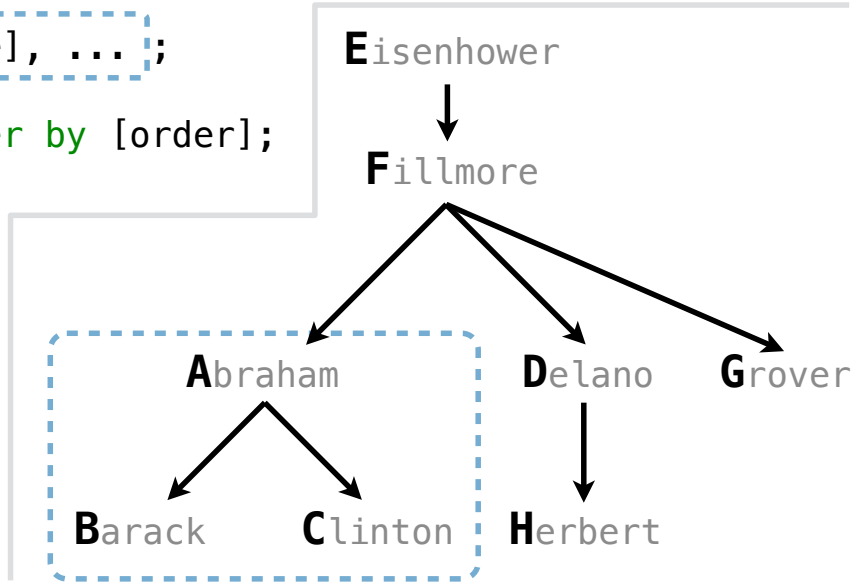

Child
barack
clinton



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select parent from parents where parent > child;
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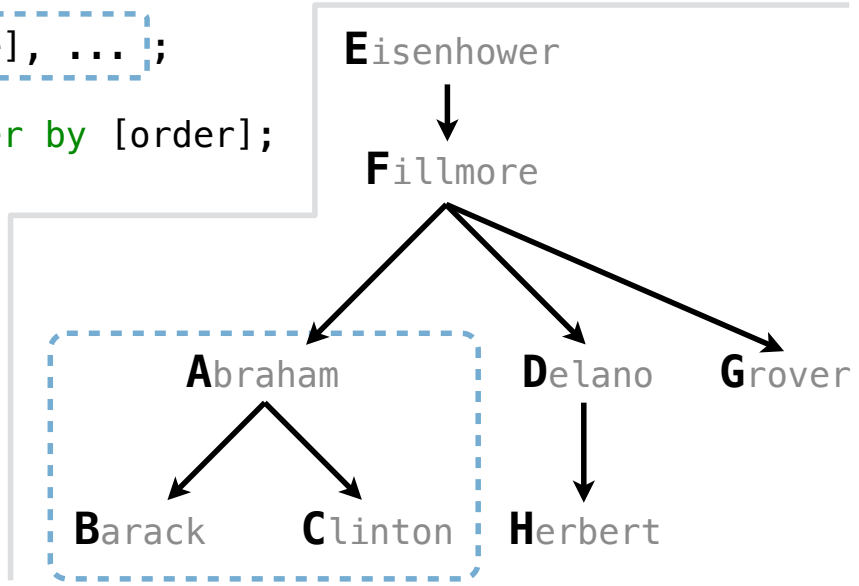
barack
clinton



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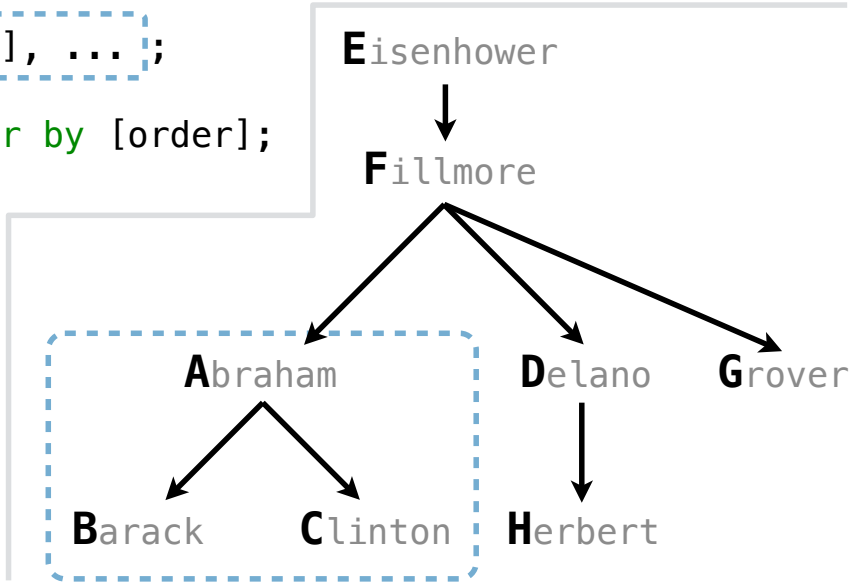
```

Child
barack
clinton

Parent
fillmore
fillmore



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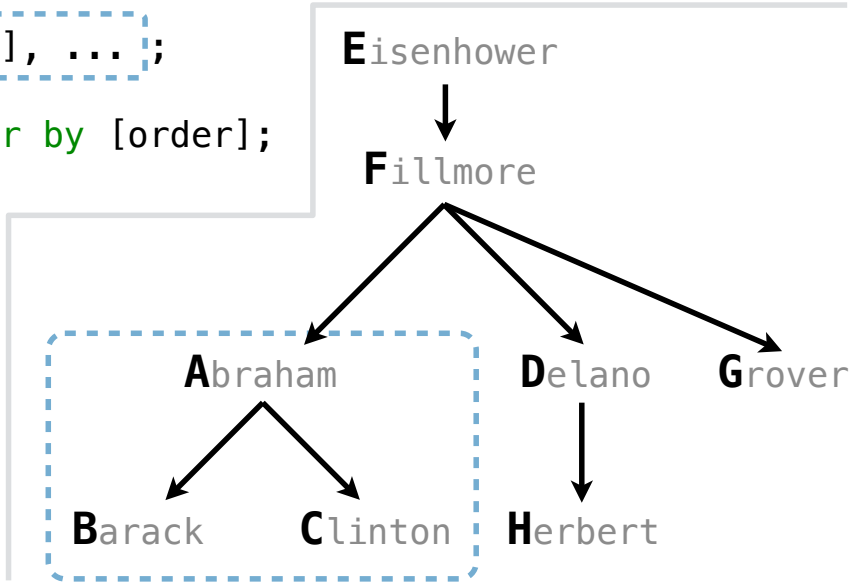
Child
barack
clinton

Parent
fillmore
fillmore

(Demo)



Arithmetic

Arithmetic in Select Expressions

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In a select expression, column names evaluate to row values

Arithmetic expressions can combine row values and constants

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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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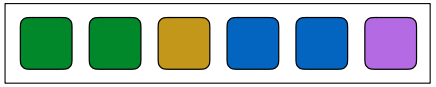

101

Arithmetic in Select Expressions

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Arithmetic expressions can combine row values and constants

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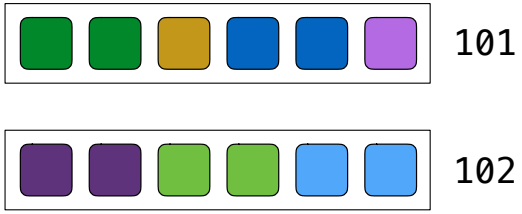

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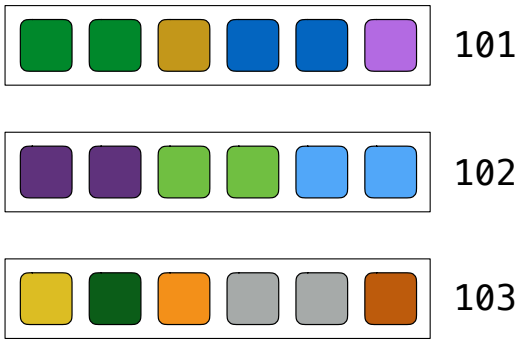

Arithmetic in Select Expressions

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

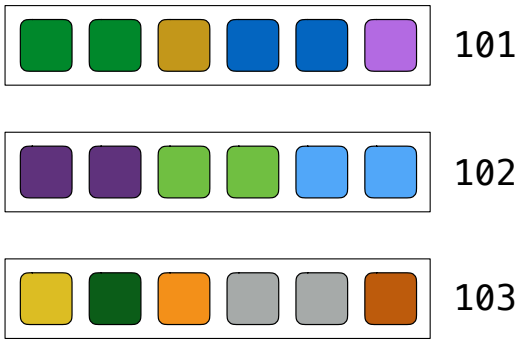

Arithmetic in Select Expressions

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create table lift as
  select 101 as chair, 2 as single, 2 as couple union
  select 102         , 0          , 3           union
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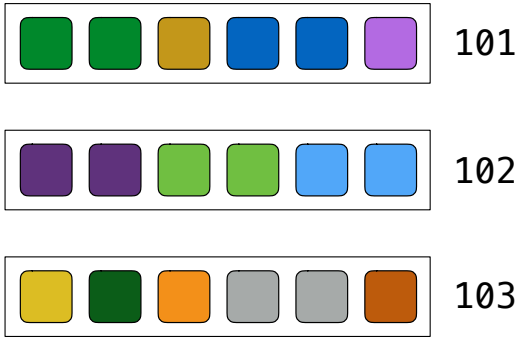
select chair, single + 2 * couple as total from lift;
```

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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```

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

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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
one	1
two	2
three	3
...	...

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  select "zero" as word, 0 as one, 0 as two, 0 as four, 0 as eight 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
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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(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

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...	...

(Demo)

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

word
one
two
four
eight