# SQL

# Announcements

# Databases

# Database Management Systems

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A **table** has columns and rows

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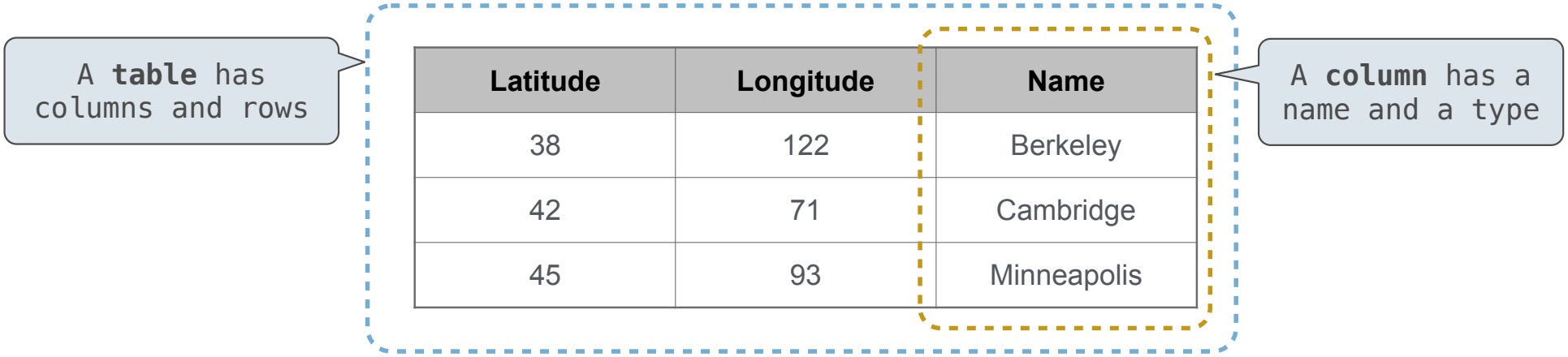

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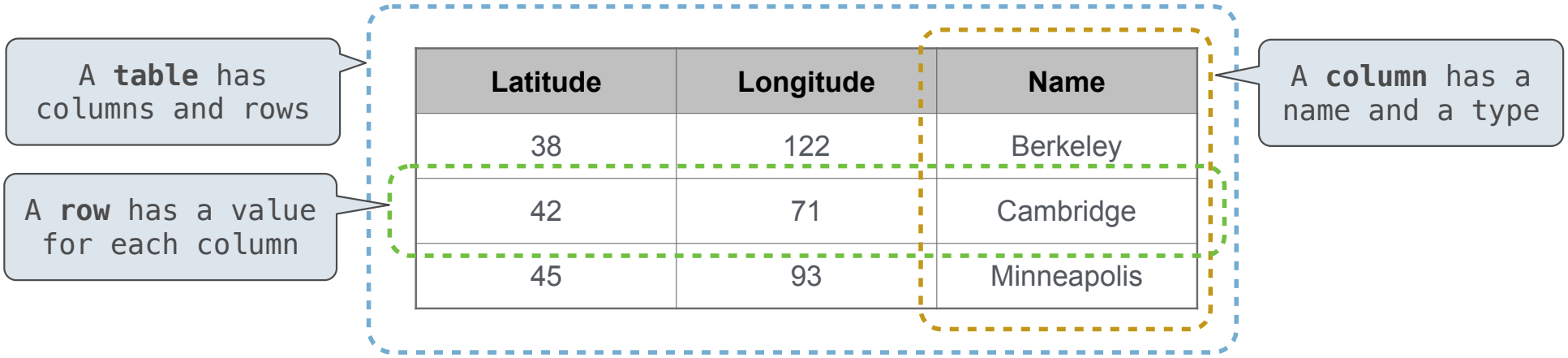

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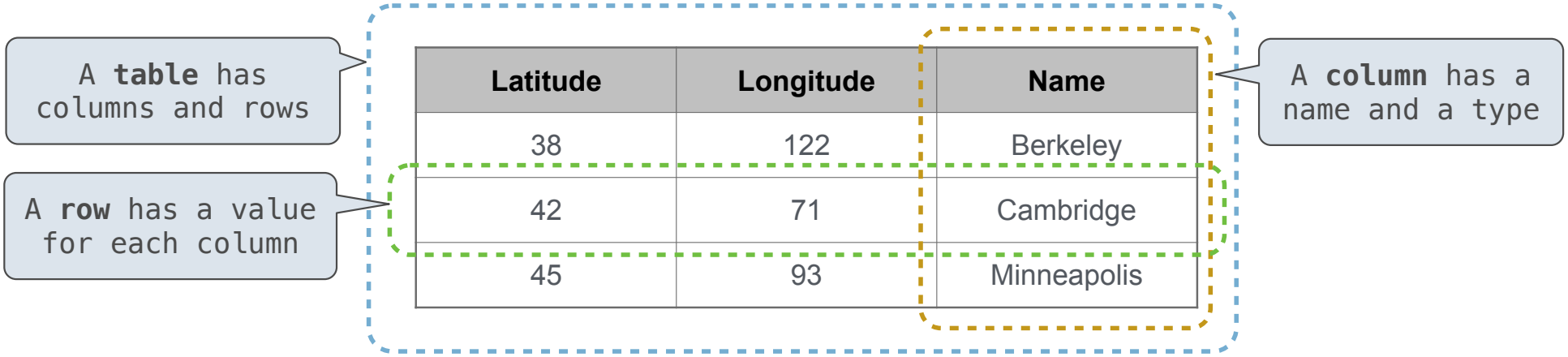


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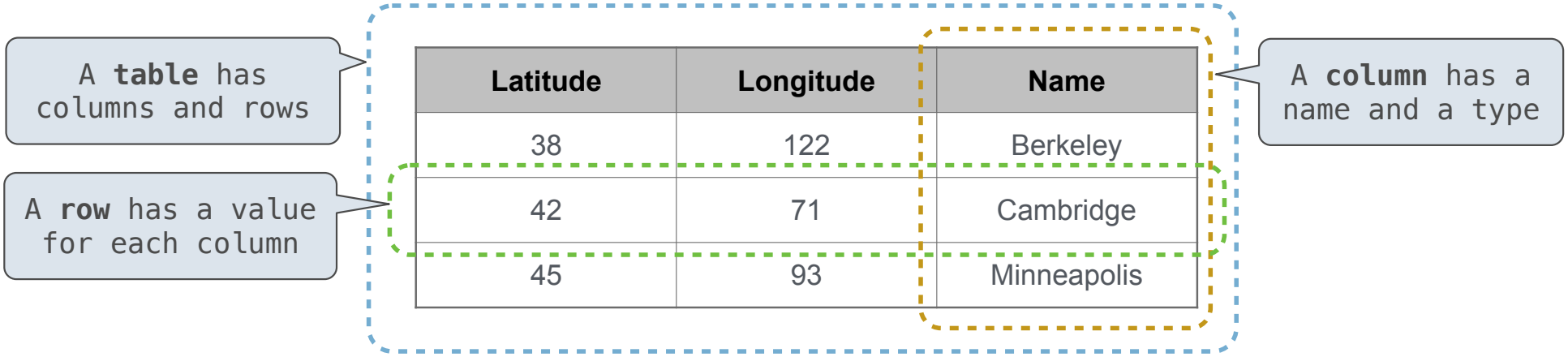


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SQL is a *declarative* programming language

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# Structured Query Language (SQL)

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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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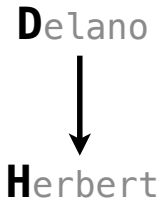

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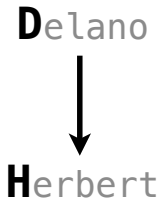

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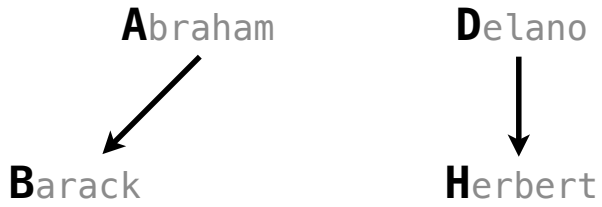

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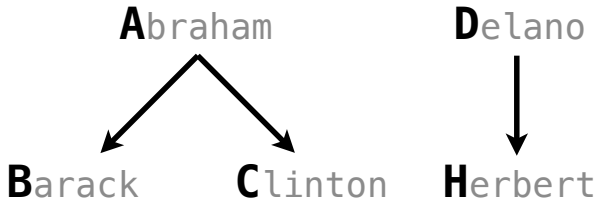

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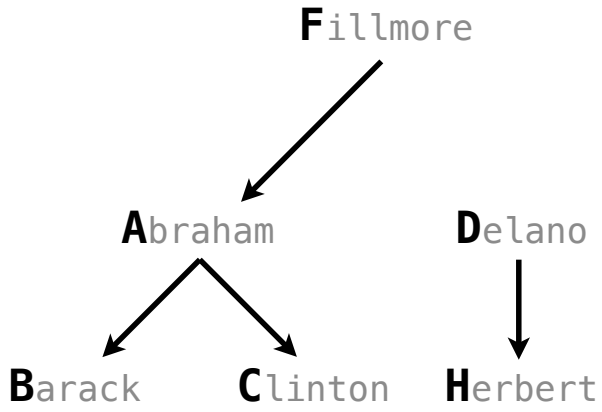

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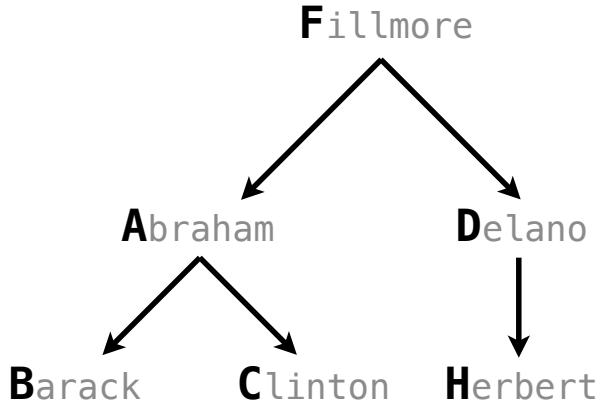

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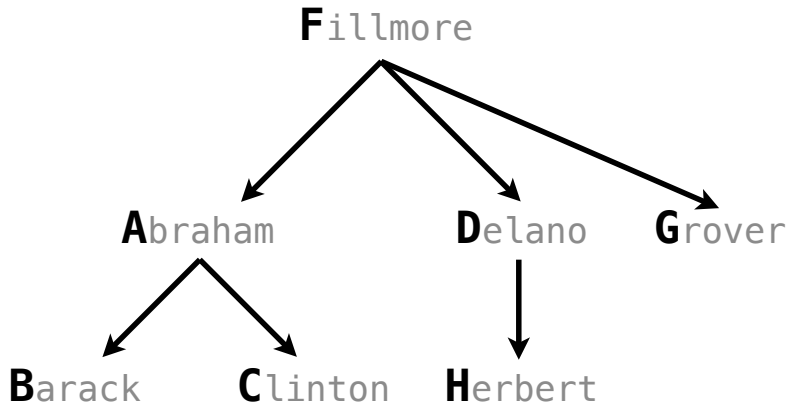

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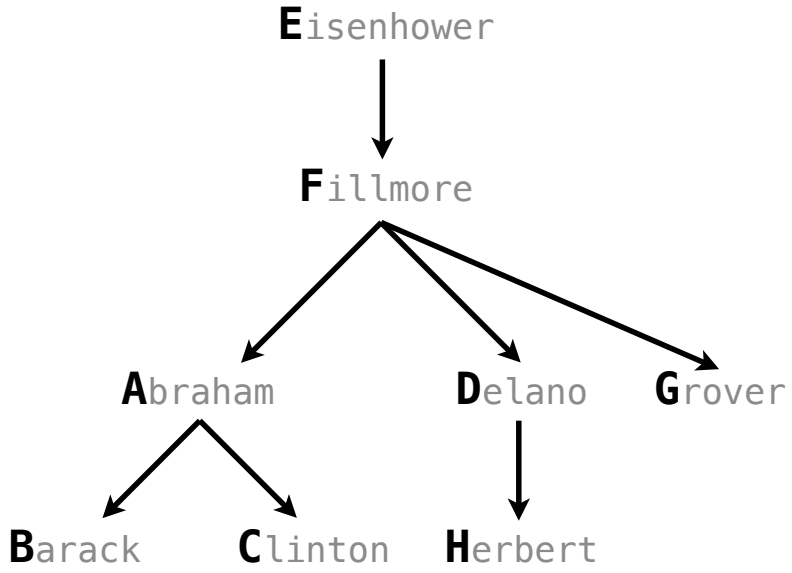

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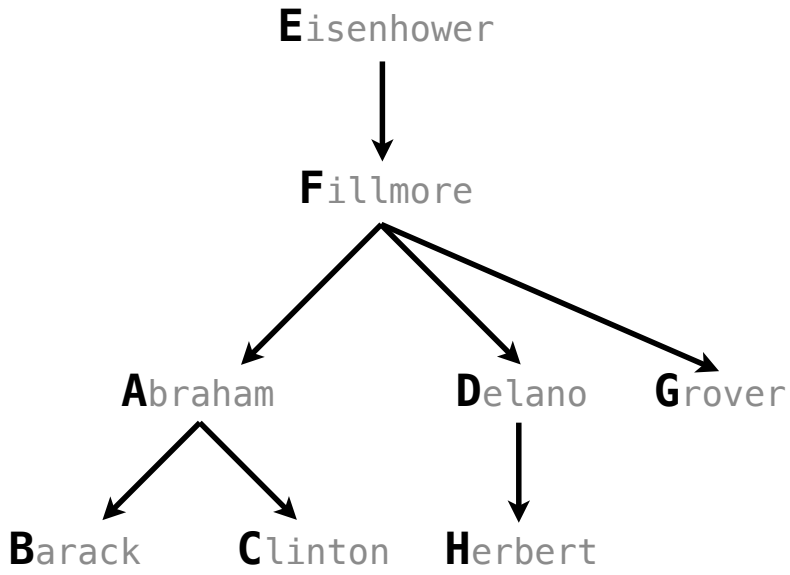

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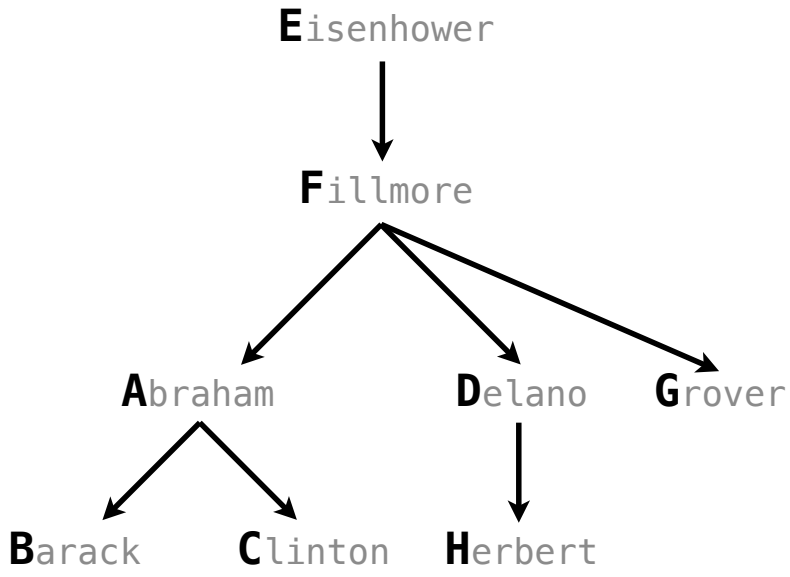

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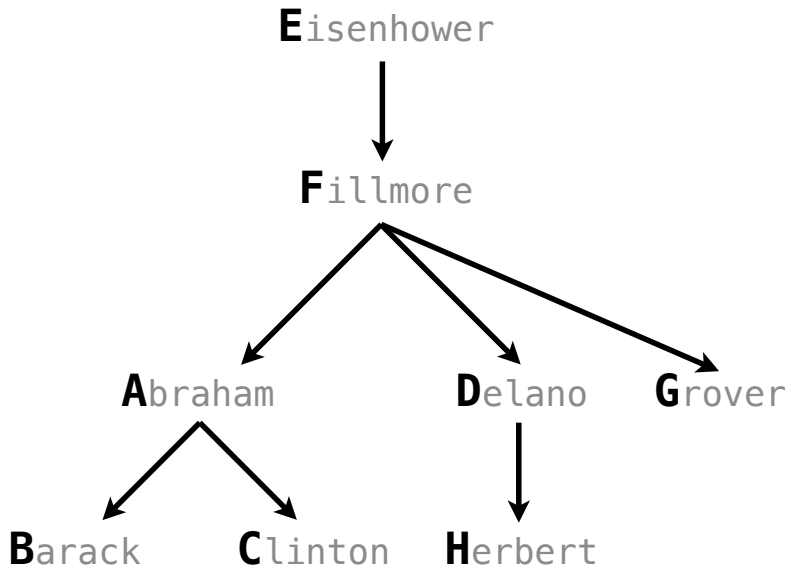

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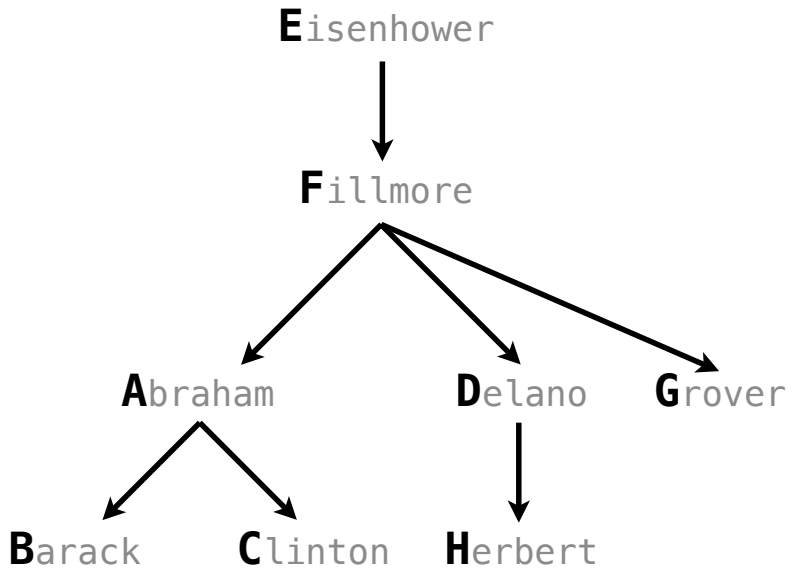

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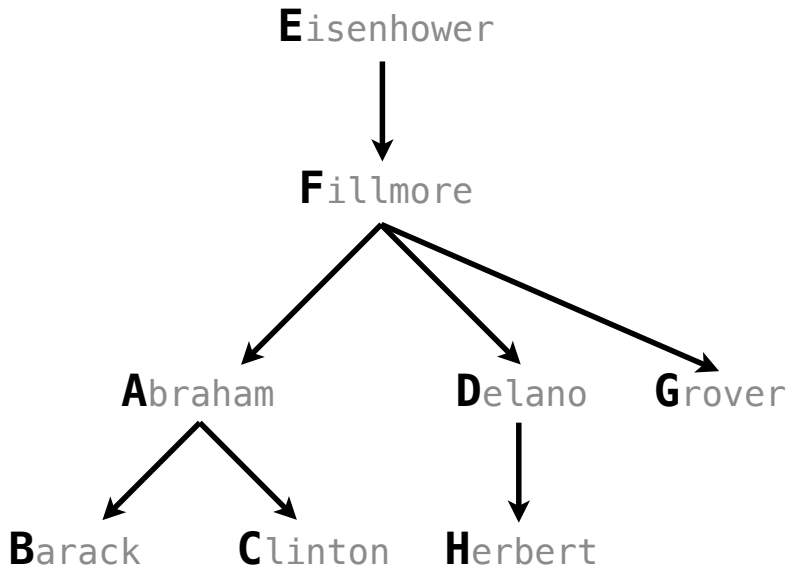

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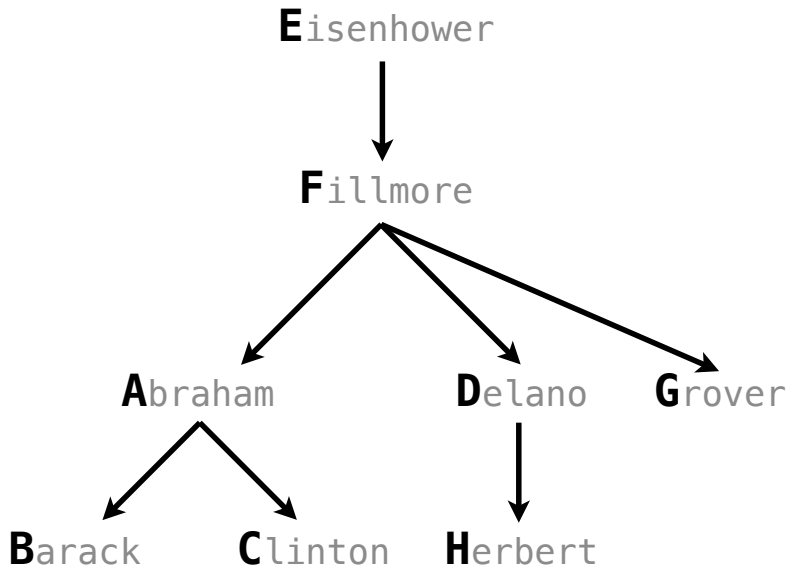

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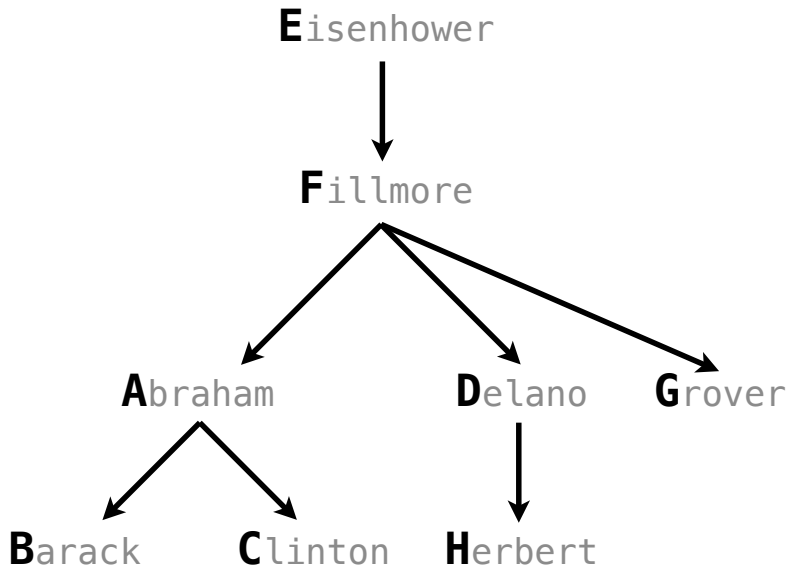

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  select "fillmore"        , "abraham"         union
  select "fillmore"        , "delano"          union
  select "fillmore"        , "grover"          union
  select "eisenhower"      , "fillmore";
```

**Parents:**

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

# Projecting Tables

# Select Statements Project Existing Tables

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

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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

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

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

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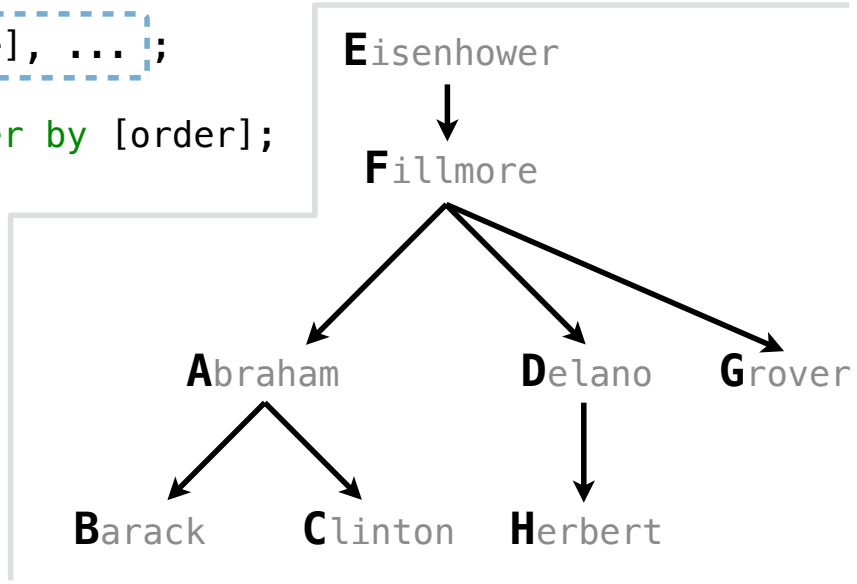

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select [columns] from [table] where [condition] order by [order];
```
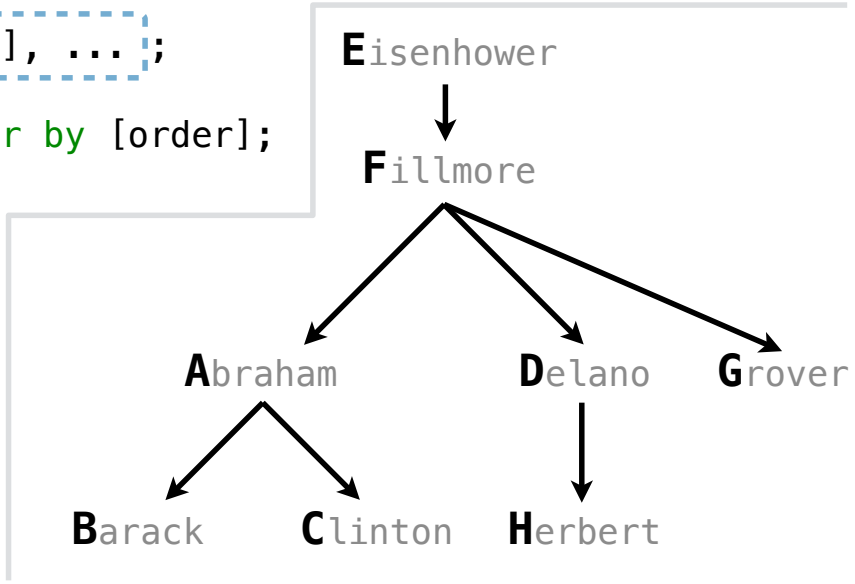

```
select child from parents where parent = "abraham";
```



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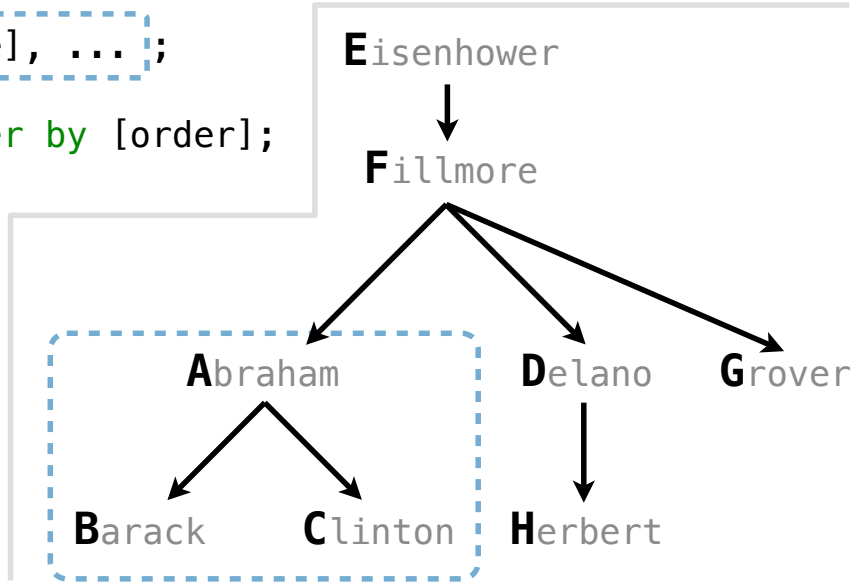

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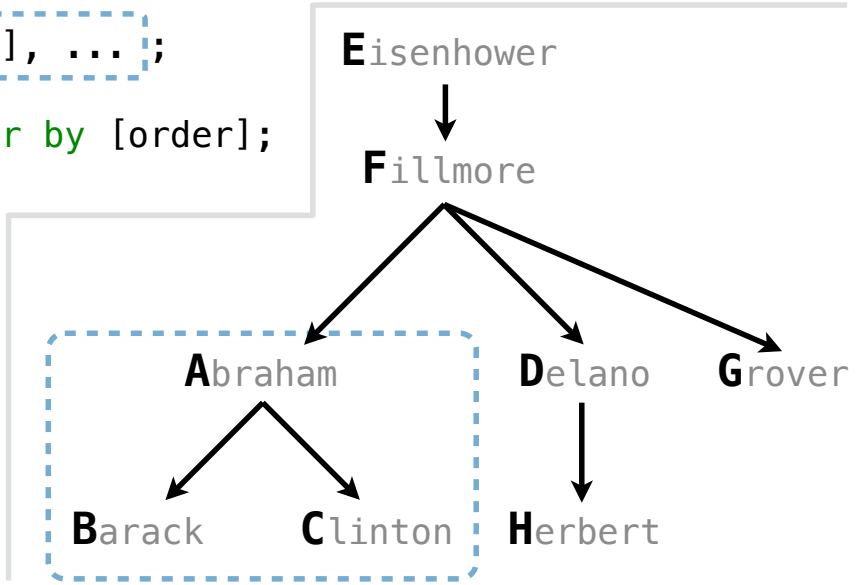
```

| child |
| --- |
| barack |
| clinton |



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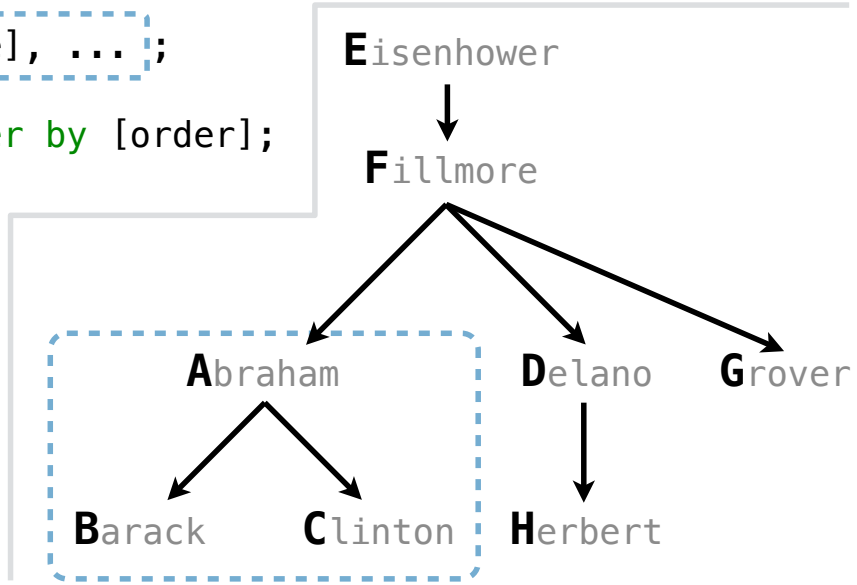
```
select [expression] as [name], [expression] as [name], ...;
select [columns] from [table] where [condition] order by [order];
select child from parents where parent = "abraham";
select parent from parents where parent > child;
```

| child |
| --- |
| barack |
| clinton |



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```
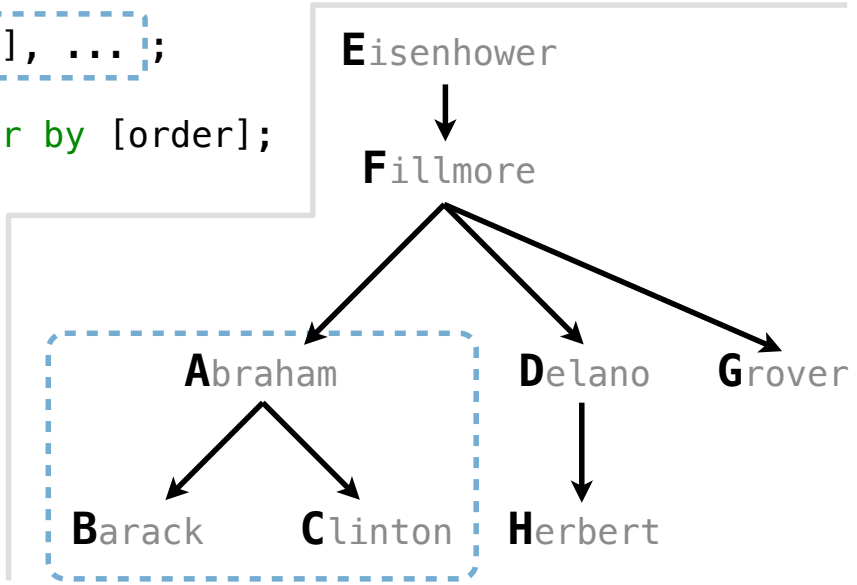

| child |
| --- |
| barack |
| clinton |

| parent |
| --- |
| fillmore |
| fillmore |



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```

```
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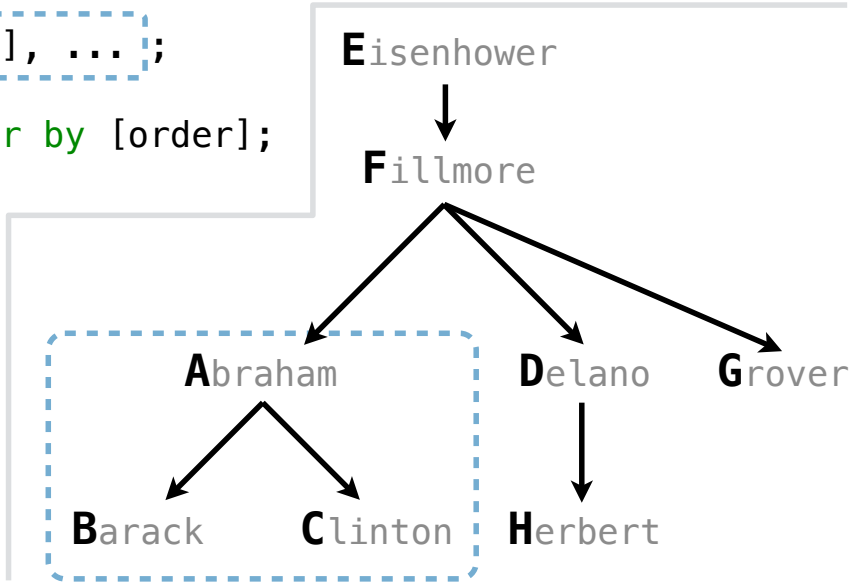
```

| 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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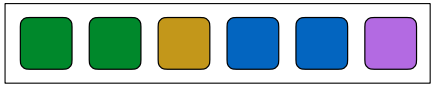

101

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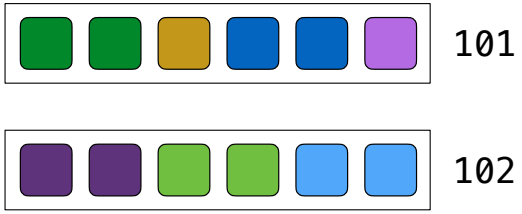

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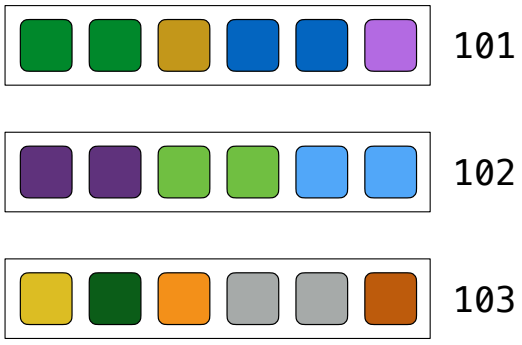


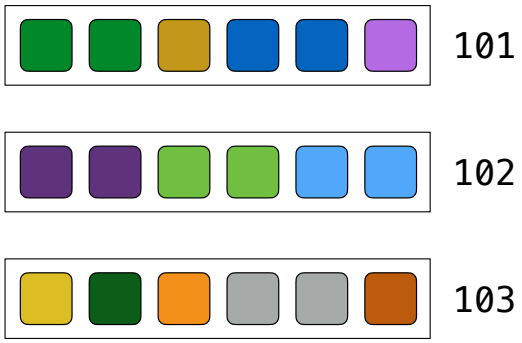
# Arithmetic in Select Expressions

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;
```



# Arithmetic in Select Expressions

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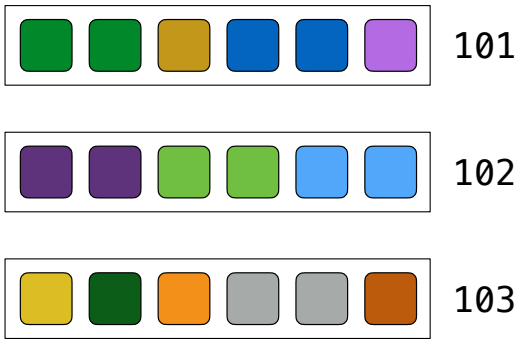
Arithmetic expressions can combine row values and constants

```
create table lift as
  select 101 as chair, 2 as single, 2 as couple union
  select 102         , 0          , 3            union
  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 "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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```

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

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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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```

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| 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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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 "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 |

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  select "six"         , 0       , 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 |
| one | 1 |
| two | 2 |
| three | 3 |
| ... | ... |

(Demo)

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

| word |
|---|
| one |
| two |
| four |
| eight |