

Grouping Rows

Rows in a table can be grouped, and aggregation is performed on each group

SELECT [columns] FROM [table] GROUP BY [expression] HAVING [expression];

The number of groups is the number of unique values of an expression SELECT legs, MAX(weight) FROM animals GROUP BY legs;

animals:

			kind	legs	weight	
legs	max(weight)	[dog	4	20	1
1 0 95		legs=4	cat	4	10	į
4	20		ferret	4	10	117
2	12000	*	parrot	2	6	
		legs=2	penguin	2	10	i
		(Demo)	t-rex	2	12000	1

Writing Select Statements

Describe the output table:

- 1) Determine which existing rows are needed to express the result (FROM & WHERE)
- 2) Form groups and determine which groups should appear as output rows (GROUP BY & HAVING)
- 3) Format the output rows (SELECT)

SELECT: Values each output row contains (and column labels)

FROM: Source of input rows

WHERE: Which input rows

GROUP BY: Form output rows

HAVING: Which output rows

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Example: UC Berkeley Employee Counts

(Demo)

Example: Select Statement Components

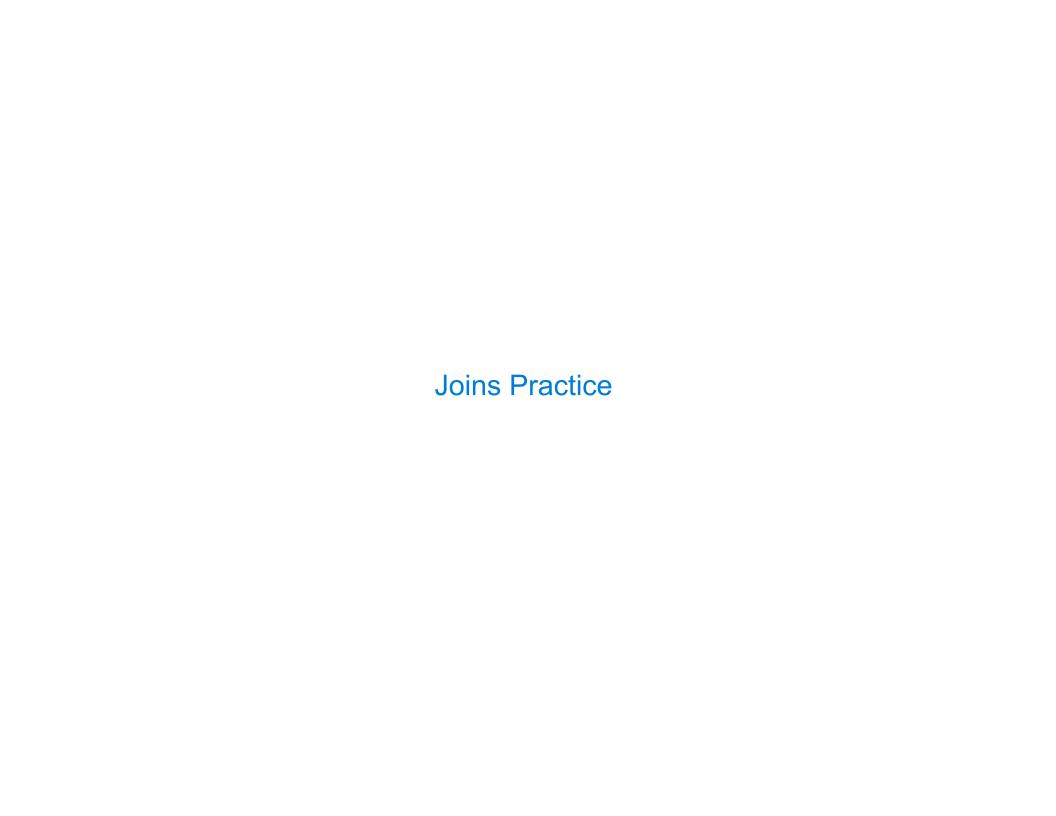
For each *type* of *employee*, compute the *fa23-fa18* difference in the total headcount, but include a row only for each *type* for which the headcount increased.

sqlite> S source	<pre>ELECT * FROM cal; type</pre>	role	fa08	fa13	fa18	fa23
employee		Grad St. Instructor (GSI)	1943	1925	2202	2248
student student	Grad Student Undergrad	Grad Student Undergrad	10258 25151	10253 25951	11666 30853	_

SELECT: Values each output row	
SELECT (type, SUM(fa23) - SUM(fa	18) AS increase
FROM cal	FROM: Source of input rows
WHERE source = "employee"	WHERE: Which input rows
GROUP BY type	GROUP BY: Form output rows

HAVING SUM(fa23) > SUM(fa18); HAVING: Which output rows

type	increase
Grad Student Titles Other Faculty Regular Faculty Staff	327 352 48 454



Discussion Question

What's the maximum difference between leg count for two animals with the same weight?

Approach #1: Consider all pairs of animals.

Approach #2: Group by weight.

animals:

kind	legs	weight
dog	4	20
cat	4	10
ferret	4	10
parrot	2	6
penguin	2	10
t-rex	2	12000

difference	
2	

Discussion Question

What are all the kinds of animals that have the maximal number of legs?

sqlite> SELECT * FROM animals WHERE legs = MAX(legs);
Parse error: misuse of aggregate function MAX()

Approach #1: Give the maximum number of legs a name.

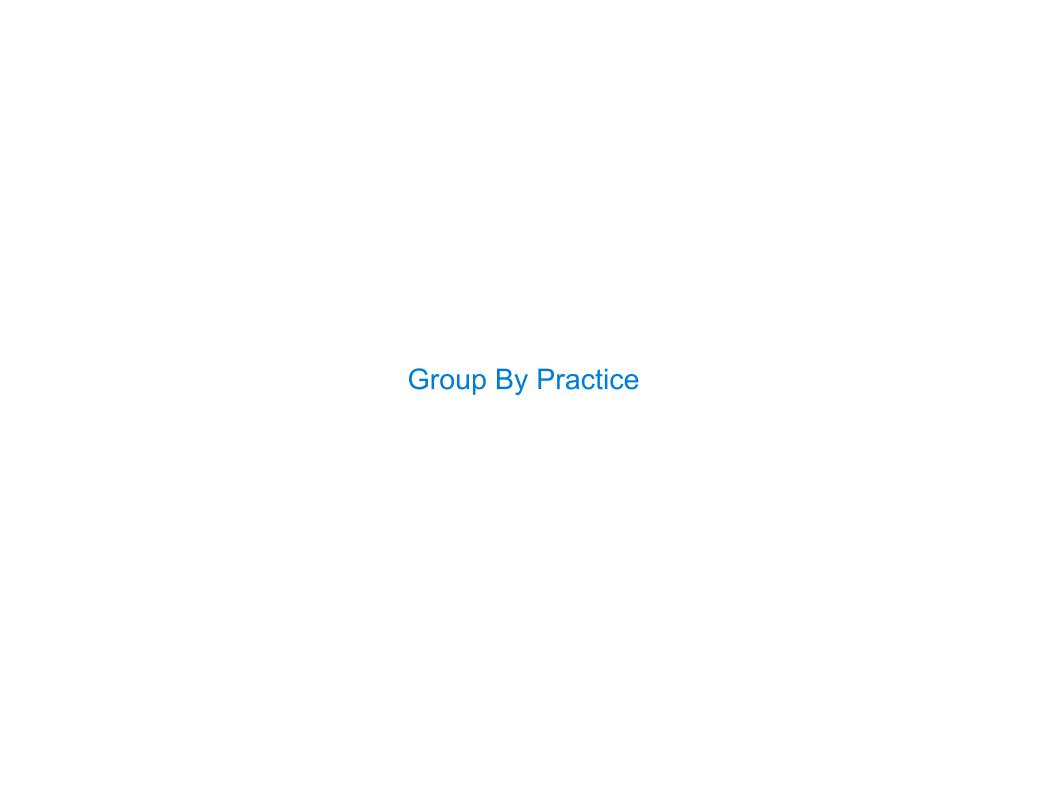
CREATE TABLE m AS SELECT <u>MAX(legs)</u> AS max_legs FROM animals; SELECT kind FROM <u>animals</u>, m WHERE legs = max_legs;

animals:

kind	legs	weight
dog	4	20
cat	4	10
ferret	4	10
parrot	2	6
penguin	2	10
t-rex	2	12000

Approach #2: For each kind of animal, compare its legs to the maximum legs by grouping.

SELECT <u>a.kind</u> FROM animals AS a, animals AS b GROUP BY a.kind <u>HAVING a.legs = MAX(b.legs)</u>;



Spring 2023 CS 61A Final Question 7

The finals table has columns hall (strings) and course (strings), and has rows for each lecture hall in which a course is holding its final exam.

The sizes table has columns room (strings) and seats (numbers), and has one row per unique room on campus containing the number of seats in that room. All lecture halls are rooms.

Create a table with two columns, course (string) and seats (number), and with one row containing the name of the course and the total number of seats in final rooms for that course. Only include a row for each course that uses at least two rooms for its final.

SELECT course, SUM(seats) AS seats
FROM finals, sizes
WHERE hall=room
GROUP BY course

HAVING COUNT(*) > 1

finals:	hall	course
	RSF	61A
S	Wheeler	61A
	RSF	61B

sizes:	room	seats
	RSF	900
	Wheeler	700
	310 Soda	40

result:	course	seats
	61A	1600