Model 1 Product and Join

Mathematically speaking, we combine tables by "multiplying" them. Every row in the right table is appended to every row in the left table:

A

let
A
B
C

B

num
1
2

A × B

let	num
A	1
A	2
B	1
B	2
C	1
C	2

In relational databases, a ***join*** operation is a product followed by a condition. The condition is used to specify which of the combined rows should be part of the result.

course

cid	dept	num
13466	CS	101
13468	CS	149
56482	MATH	231

teach

cid	pid
13466	2774
13468	2774
13466	9036
13468	9036

professor

pid	dept	name
2774	CS	Mayfield
9036	CS	Stewart
1158	MATH	Taalman
5241	SCOM	Hazard

course × teach

cid	dept	num	cid	pid
13466	CS	101	13466	2774
13466	CS	101	13468	2774
13466	CS	101	13466	9036
13466	CS	101	13468	9036
13468	CS	149	13466	2774
13468	CS	149	13468	2774
13468	CS	149	13466	9036
13468	CS	149	13468	9036
56482	MATH	231	13466	2774
56482	MATH	231	13468	2774
56482	MATH	231	13466	9036
56482	MATH	231	13468	9036

JOIN course.cid = teach.cid (course, teach)

cid	dept	num	cid	pid
13466	CS	101	13466	2774
13466	CS	101	13466	9036
13468	CS	149	13468	2774
13468	CS	149	13468	9036

Questions (10 min) Start time: _____

1. How many rows and columns are in:

a) the course table? 3 rows, 3 cols

b) the teach table? 4 rows, 2 cols

c) course × teach? 12 rows, 5 cols

2. Consider a table with i rows and j columns, and another table with k rows and l columns.

a) how many rows will be in the product? $i * k$

b) how many columns will be in the product? $j + l$

3. Discuss how the results of "course × teach" are different from the JOIN operation. Then in Model 1, draw an arrow from each result in the JOIN to the corresponding row in the product.

There should be four arrows: row 1 ← row 1, row 3 ← row 2, row 6 ← row 3, row 8 ← row 4.

4. What is the result of JOIN teach.pid = professor.pid (teach, professor)? Don't forget to include the column names.

cid	pid	pid	dept	name
13466	2774	2774	CS	Mayfield
13468	2774	2774	CS	Mayfield
13466	9036	9036	CS	Stewart
13468	9036	9036	CS	Stewart

5. Describe what relational operations you would have to use to find the names of all professors who teach CS 101. (The results should have 2 rows and 1 column.)

You would first have to join the course, teach, and professor tables using the conditions "cid = cid" and "pid = pid". Then you would need to apply a selection on the rows with "CS 101". Finally, you would need to project the "name" column.