SQL: natural joins

Credit: Dr. Bruns

Joins can be a little annoying

instructor

ID	name	dept_name	salary
10101	Srinivasan	Comp. Sci.	65000
12121	Wu	Finance	90000
15151	Mozart	Music	40000
22222	Einstein	Physics	95000
32343	El Said	History	60000

teaches

ID	course_id	sec_id	semester	year
10101	CS-101	1	Fall	2009
10101	CS-315	1	Spring	2010
10101	CS-347	1	Fall	2009
12121	FIN-101	1	Spring	2010
15151	MUS-199	1	Spring	2010

```
select name, course_id
 from instructor, teaches
    on instructor.ID = teaches.ID;
```

What makes this SQL annoying to write?

What is wrong with this SQL?

instructor

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teaches

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15151	MUS-199	1	Spring	2010

```
select ID, course_id
  from instructor, teaches
     on instructor.ID = teaches.ID;
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Natural joins

instructor

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old way:

select instructor.ID, course_id
  from instructor, teaches
on instructor.ID = teaches.ID;

using natural join:

select ID, course_id
  from instructor **natural join** teaches;

What is the natural join?

course

course_id	title	dept_name	credits
BIO-101	Intro. to Biology	Biology	4
BIO-301	Genetics	Biology	4
BIO-399	Computational Biology	Biology	3
CS-101	Intro. to Computer Science	Comp. Sci.	4
CS-190	Game Design	Comp. Sci.	4
CS-315	Robotics	Comp. Sci.	3
CS-319	Image Processing	Comp. Sci.	3

section

course_id	sec_id	semester	year	building	room_number	time_slot_id
BIO-101	1	Summer	2009	Painter	514	B
BIO-301	1	Summer	2010	Painter	514	A
CS-101	1	Fall	2009	Packard	101	H
CS-101	1	Spring	2010	Packard	101	F
CS-190	1	Spring	2009	Taylor	3128	E
CS-190	2	Spring	2009	Taylor	3128	A
CS-315	1	Spring	2010	Watson	120	D

select course.course_id, title, semester, year
  from course, section
    on course.course_id = section.course_id;

how to write this with natural join?

select course_id, title, semester, year
  from course natural join section;

Queries on more than 2 tables

teaches

ID	course_id	sec_id	semester	year
10101	CS-101	1	Fall	2009
10101	CS-315	1	Spring	2010
10101	CS-347	1	Fall	2009
12121	FIN-101	1	Spring	2010

section

course_id	sec_id	semester	year	building	room_number	time_slot_id
BIO-101	1	Summer	2009	Painter	514	B
BIO-301	1	Summer	2010	Painter	514	A
CS-101	1	Fall	2009	Packard	101	H
CS-101	1	Spring	2010	Packard	101	F

instructor

ID	name	dept_name	salary
10101	Srinivasan	Comp. Sci.	65000
12121	Wu	Finance	90000
15151	Mozart	Music	40000

What rooms do the instructors teach in?

select name, building, room_number
  from teaches **natural join** section
natural join instructor;

name	building	room_number
Srinivasan	Packard	101
Srinivasan	Watson	120
Srinivasan	Taylor	3128
Einstein	Watson	100
El Said	Painter	514
Katz	Packard	101
Katz	Watson	100
Crick	Painter	514
Crick	Painter	514
Brandt	Taylor	3128
Brandt	Taylor	3128
Brandt	Taylor	3128
Kim	Taylor	3128

Be careful with natural joins ⚠️

department

dept_name	building	budget
Biology	Watson	90000
Comp. Sci.	Taylor	100000
Elec. Engr.	Taylor	85000
Finance	Painter	120000

section

course_id	sec_id	semester	year	building	room_number	time_slot_id
BIO-101	1	Summer	2009	Painter	514	B
BIO-301	1	Summer	2010	Painter	514	A
CS-101	1	Fall	2009	Packard	101	H
CS-101	1	Spring	2010	Packard	101	F

course

course_id	title	dept_name	credits
BIO-101	Intro. to Biology	Biology	4
BIO-301	Genetics	Biology	4
BIO-399	Computational Biology	Biology	3
CS-101	Intro. to Computer Science	Comp. Sci.	4
CS-190	Game Design	Comp. Sci.	4

For each course taught in 2016, what is title, and what is budget of dept. that offers the course?

select title, budget
  from section **natural join** course **natural join** department
where year = 2016;

Does this work?

Solution

department

dept_name	building	budget
Biology	Watson	90000
Comp. Sci.	Taylor	100000
Elec. Engr.	Taylor	85000
Finance	Painter	120000

section

course_id	sec_id	semester	year	building	room_number	time_slot_id
BIO-101	1	Summer	2009	Painter	514	B
BIO-301	1	Summer	2010	Painter	514	A
CS-101	1	Fall	2009	Packard	101	H
CS-101	1	Spring	2010	Packard	101	F

course

course_id	title	dept_name	credits
BIO-101	Intro. to Biology	Biology	4
BIO-301	Genetics	Biology	4
BIO-399	Computational Biology	Biology	3
CS-101	Intro. to Computer Science	Comp. Sci.	4
CS-190	Game Design	Comp. Sci.	4

For each course taught in 2016, what is title, and what is budget of dept. that offers the course?

select title, budget
  from section **natural join** course, department
where department.dept_name = course.dept_name
and year = 2016;

Joins with other SQL features

teaches

ID	course_id	sec_id	semester	year
10101	CS-101	1	Fall	2009
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12121	FIN-101	1	Spring	2010

section

course_id	sec_id	semester	year	building	room_number	time_slot_id
BIO-101	1	Summer	2009	Painter	514	B
BIO-301	1	Summer	2010	Painter	514	A
CS-101	1	Fall	2009	Packard	101	H
CS-101	1	Spring	2010	Packard	101	F

instructor

ID	name	dept_name	salary
10101	Srinivasan	Comp. Sci.	65000
12121	Wu	Finance	90000
15151	Mozart	Music	40000

What rooms do the instructors teach in?

select distinct name, building, room_number
from teaches **natural join** section
          natural join instructor
order by name, building, room_number;

name	building	room_number
Brandt	Taylor	3128
Crick	Painter	514
Einstein	Watson	100
El Said	Painter	514
Katz	Packard	101
Katz	Watson	100
Kim	Taylor	3128
Srinivasan	Packard	101
Srinivasan	Taylor	3128
Srinivasan	Watson	120

Using join as a filter

award

ID	award_name	year
10101	ACM Turing	2008
32343	Asher	1999
32343	Beer Prize	2003
33456	Nobel	2013
76766	Nobel	2001

instructor

ID	name	dept_name	salary
10101	Srinivasan	Comp. Sci.	65000
12121	Wu	Finance	90000
15151	Mozart	Music	40000
22222	Einstein	Physics	95000
32343	El Said	History	60000
33456	Gold	Physics	87000
45565	Katz	Comp. Sci.	75000
58583	Califieri	History	62000
76543	Singh	Finance	80000
76766	Crick	Biology	72000
83821	Brandt	Comp. Sci.	92000
98345	Kim	Elec. Eng.	80000

What are the names, depts, and salaries of award-winning instructors?

select distinct name, dept_name, salary
  from award **natural join** instructor;

Summary

Natural joins are often used and are convenient

☐ no need to write **where** clause to show matching columns

☐ often simplifies **select** clause, too

Beware of accidental column matching!