1.
employee (id, person_name, street, city)
works (person_name, company_name, salary)
company (company_name, city)

• Find the ID and name of each employee who works for “BigBank”.

$$\prod_{id,person\_name}\left(\sigma_{company\_name=\text{BigBank}}(works)\right)$$

• Find the ID, name, and city of residence of each employee who works for “BigBank”.

$$\prod_{id,person\_name,city}\left(\sigma_{company\_name=\text{BigBank}}\left(\sigma_{employee.person\_name=works.person\_name}(employee \times works)\right)\right)$$

• Find the ID, name, street address, and city of residence of each employee who works for “BigBank” and earns more than $10000.

$$\prod_{id,person\_name,street,city}\left(\sigma_{company\_name=\text{ BigBank} \wedge \text{salary>10000}}\left(\sigma_{employee.person\_name\ =\ works.person\_name}(employee \times works)\right)\right)$$

• Find the ID and name of each employee in this database who lives in the same city as the company for which she or he works.

$$\prod_{id,person\_name}\left(\left(\sigma_{employee.person\_name\ =\ works\bowtie company.person\_name\ \wedge\ employee.city\ =\ works\bowtie company.city}(employee \times works \times company)\right)\right)$$

2.

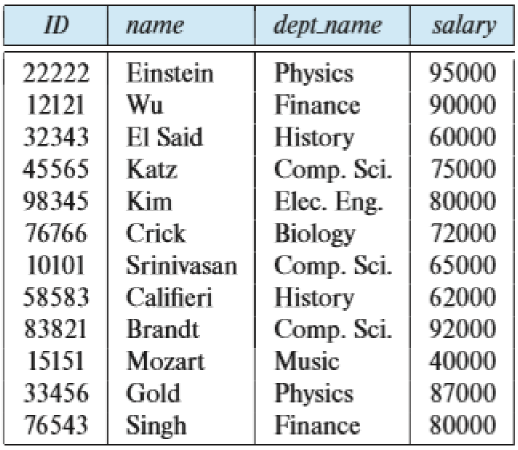
• Find the ID and name of each employee who does not work for “BigBank”.

$$\prod_{person\_name}\left(\sigma_{\neg company\_name=\text{BigBank}}(works)\right)$$

• Find the ID and name of each employee who earns at least as much as every employee in the database.

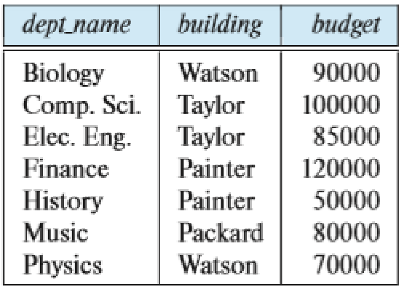
$$\prod_{person\_name}\left(\sigma_{slary\geq average(salary)}(works)\right)$$

3.



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

Figure 2.4 Unsorted display of the *instructor* relation.



dept_name	*building*	*budget*
Biology	Watson	90000
Comp. Sci.	Taylor	100000
Elec. Eng.	Taylor	85000
Finance	Painter	120000
History	Painter	50000
Music	Packard	80000
Physics	Watson	70000

Figure 2.5 The *department* relation.

Inserting (6666, Khan, Geography, 50000) into the *instructor* would violation of the foreign-key constraint, because *department* doesn't have *dept_name* Geography.

Deleting (Biology, Watson, 90000) from *department* would violation of the foreign-key constraint, because *instructor* has *dept_name* Biology

4.

Primary keys: *person_name* from *employee* and *works*, *company_name* from *company*.