

select: σ
 project: π
 union: \cup
 set difference: $-$
 Cartesian product : \times
 rename: ρ

employee (person_name, street, city)
works (person_name, company_name, salary)
company (company_name, city)

Figure

ALTER TABLE employee ADD ID INT;

1.

- 1.1. $\pi_{ID, person_name} (\sigma_{company_name = "BigBank"}(works))$
- 1.2. $\pi_{ID, person_name, city}(\sigma_{company_name = "BigBank"}(works))$
- 1.3. $\pi_{ID, person_name, street, city}(employee \bowtie_{employee.ID = works.ID}(\sigma_{company_name = "BigBank" \wedge salary > 100000}(works)))$
- 1.4. $\pi_{ID, person_name}(\sigma_{employee.city = company.city}(employee \bowtie_{person.id = company.id} works \bowtie_{works.company_name = company.company_name} company))$
- 1.5. $\sigma_{ID, person_name} FROM employee WHERE company.city = employee.city;$

2.

- 2.1. $\pi_{ID, person_name}(\sigma_{company.name \neq "BigBank"}(works))$
- 2.2. $\pi_{ID, person_name}(\sigma_{salary \geq MIN(salary)}(works))$

<i>ID</i>	<i>name</i>	<i>dept_name</i>	<i>salary</i>
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	Califleri	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.

<i>dept_name</i>	<i>building</i>	<i>budget</i>
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.

3.

3.1. For example, let's insert (99999, Decart, Mathematics, 20000) to instructor.

There will be violation of foreign key constraint because there is no Mathematics in department table.

Let's delete (Biology, Watson, 90000) from department. There will be violation of the foreign key because instructor has a person who has Biology department.

4. Person ID for employee, because in the company there might be people with similar names

ID for works. ID is also unique here.

Company - company_name, which identifies the company itself