

1. Retrieve the names of all employees in department 5 who work more than 10 hours per week on the ProductX project.

$\pi_{\text{fname, lname}} ((\sigma_{\text{dno} = 5} (\text{EMPLOYEE})) \bowtie_{\text{ssn} = \text{essn}} (\sigma_{\text{hours} > 10 \wedge \text{pno} = 1} (\text{WORKS_ON})))$

2. List the names of all employees who have a dependent with the same first name as themselves.

$\pi_{\text{fname, lname}} (\sigma_{\text{fname} = \text{dependent_name}} (\text{EMPLOYEE} \bowtie_{\text{ssn} = \text{essn}} (\pi_{\text{essn, dependent_name}} (\text{DEPENDENTS}))))$

3. Find the names of all employees who are directly supervised by 'Franklin Wong'.

$P(\text{Wong}, \pi_{\text{ssn}} (\sigma_{\text{fname} = \text{'Franklin'} \wedge \text{lname} = \text{'Wong'}} (\text{EMPLOYEE})))$

$\pi_{\text{fname, lname}} (\sigma_{\text{super_ssn} = \text{Wong.ssn}} (\text{EMPLOYEE}))$

4. For each project, list the project name and the total hours per week (by all employees) spent on that project.

$\alpha_{\text{pname, sum(hours)}} (\text{WORKS_ON} \bowtie_{\text{pno} = \text{pnumber}} \text{PROJECT})$

5. Retrieve the names of all employees who work on every project.

$\pi_{\text{fname, lname}} (\text{EMPLOYEE} \bowtie_{\text{ssn} = \text{essn}} (\pi_{\text{essn}} (\text{WORKS_ON} / (P(\text{PROJNUM}(\text{pno}) (\pi_{\text{pnumber}} (\text{PROJECT})))))))$

6. Retrieve the names of all employees who do not work on any project.

$\pi_{\text{fname, lname}} (\text{EMPLOYEE} - (\text{EMPLOYEE} \bowtie_{\text{ssn} = \text{essn}} (\pi_{\text{essn}} (\text{WORKS_ON}))))$

7. For each department, retrieve the department name and the average salary of all employees working in that department.

$\alpha_{\text{dname, avg(salary)}} (\text{EMPLOYEE} \bowtie_{\text{dno} = \text{dnumber}} \text{DEPARTMENT})$

8. Retrieve the average salary of all female employees

$\alpha_{\text{avg(salary)}} (\sigma_{\text{sex} = \text{'F'}} (\text{EMPLOYEE}))$

9. Find the names and addresses of all employees who work on at least one project located in Houston but whose department has no location in Houston.

$$\pi_{fname, lname, address} ((EMPLOYEE \bowtie_{ssn=essn} (\pi_{essn} (\sigma_{pno=3 \vee pno=20} (WORKS_ON)))) \\ - (\sigma_{dno=1 \vee dno=5} (EMPLOYEE)))$$

10. List the last names of all department managers who have no dependents.

$$P (SUPER(ssn) (\pi_{super_ssn} (EMPLOYEE)))$$

$$\pi_{lname} ((\sigma_{ssn=SUPER.ssn} (EMPLOYEE)) - (EMPLOYEE \bowtie_{ssn=essn} (\pi_{essn} DEPENDENTS)))$$