Chapters 8 and 10 Project

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All database objects (tables and fields) in SSMS.

Creating and Connecting to the "EMPLOYEE" Database

```
Last login: Sat Mar 21 11:30:19 on ttys001
/Library/PostgreSQL/12/scripts/runpsql.sh; exit
Bens-MacBook-Air:~ benhanson$ /Library/PostgreSQL/12/scripts/runpsql.sh; exit
Server [localhost]:
Database [postgres]:
Port [5432]:
Username [postgres]:
Password for user postgres:
psql (12.2)
Type "help" for help.

postgres=# CREATE DATABASE employee;
CREATE DATABASE
postgres=# \c employee
You are now connected to database "employee" as user "postgres".
employee=#
```

Creating "EMPLOYEE" Table in the EMPLOYEE Database

```
employee=# CREATE TABLE EMPLOYEE  (
employee(# Fname VARCHAR(50),
employee(# Minit VARCHAR(1),
employee(# Lname VARCHAR(50),
employee(# Ssn int PRIMARY KEY,
employee(# Bdate DATE,
employee(# Address VARCHAR(100),
employee(# Sex VARCHAR(1),
employee(# Salary int,
employee(# Super_ssn int,
employee(# Dno int  );
CREATE TABLE
employee=#
```

Creating "DEPARTMENT" Table in the EMPLOYEE Database

```
employee=#
employee=# CREATE TABLE DEPARTMENT  (
employee(# Dname varchar(50),
employee(# Dnumber int PRIMARY KEY,
employee(# Mgr_ssn int,
employee(# Mgr_start_date DATE  );
CREATE TABLE
employee=#
```

Creating "DEPT_LOCATIONS" Table in the EMPLOYEE Database

```
employee=# CREATE TABLE DEPT_LOCATIONS  (
employee(# Dnumber int PRIMARY KEY,
employee(# Dlocation VARCHAR(50)  );
CREATE TABLE
employee=#
```

Creating "WORKS_ON" Table in the EMPLOYEE Database

```
employee=# CREATE TABLE WORKS_ON (
employee(# Essn int PRIMARY KEY,
employee(# Pno int,
employee(# Hours int  );
CREATE TABLE
employee=#
```

Creating "PROJECT" Table in the EMPLOYEE Database

```
employee=# CREATE TABLE PROJECT  (
employee(# Pname VARCHAR(50),
employee(# Pnumber int PRIMARY KEY,
employee(# Plocation VARCHAR(50),
employee(# Dnum int  );
CREATE TABLE
employee=#
```

Creating "DEPENDENT" Table in the EMPLOYEE Database

```
employee=# CREATE TABLE DEPENDENT  (
employee(# Essn int PRIMARY KEY,
employee(# Dependent_name  VARCHAR(50),
employee(# Sex VARCHAR(1),
employee(# Bdate DATE,
employee(# Relationship VARCHAR(50)  );
CREATE TABLE
employee=#
```

Placing Data Into the "EMPLOYEE" table, for "John Smith"

```
employee=# INSERT INTO EMPLOYEE  (
employee(# Fname, Minit, Lname, Ssn, Bdate, Address, Sex, Salary, Super_ssn, Dno)
employee-# VALUES ('John', 'B', 'Smith', '123456789', DATE '1965-01-09', '731 Fondren, Houston, TX', 'M', '30000',
INSERT 0 1
employee=#
```

Placing Data Into the "EMPLOYEE" table, for "Franklin Wong"

```
employee=# INSERT INTO EMPLOYEE  (Fname, Minit, Lname, Ssn, Bdate, Address, Sex, Salary, Super_ssn, Dno)
employee-# VALUES ('Franklin', 'T', 'Wong', '333445555', DATE '1955-12-08', '638 Voss, Houston, TX', 'M', '40000', '8886
INSERT 0 1
employee=#
```

Placing Data Into the "EMPLOYEE" table, for "Alicia Zelaya", and so on

```
employee=# INSERT INTO EMPLOYEE  (Fname, Minit, Lname, Ssn, Bdate, Address, Sex, Salary, Super_ssn, Dno)
employee-# VALUES ('Alicia', 'J', 'Zelaya', '999887777', DATE '1968-01-19', '3321 Castle, Spring, TX', 'F', '25000', '987654321', '4'
INSERT 0 1
employee=# INSERT INTO EMPLOYEE  (Fname, Minit, Lname, Ssn, Bdate, Address, Sex, Salary, Super_ssn, Dno)
employee-# VALUES ('Jennifer', 'S', 'Wallace', '987654321', DATE '1941-06-20', '291 Berry, Bellaire, TX', 'F', '43000', '888665555',
INSERT 0 1
employee=# INSERT INTO EMPLOYEE  (Fname, Minit, Lname, Ssn, Bdate, Address, Sex, Salary, Super_ssn, Dno)
employee-# VALUES ('Ramesh', 'K', 'Narayan', '666884444', DATE '1962-09-15', '975 Fire Oak, Humble, TX', 'M', '38000', '333445555', '5
INSERT 0 1
employee=# INSERT INTO EMPLOYEE  (Fname, Minit, Lname, Ssn, Bdate, Address, Sex, Salary, Super_ssn, Dno)
employee-# VALUES ('Joyce', 'A', 'English', '453453453', DATE '1972-07-31', '5631 Rice, Houston, TX', 'F', '25000', '333445555', '5'
INSERT 0 1
employee=# INSERT INTO EMPLOYEE  (Fname, Minit, Lname, Ssn, Bdate, Address, Sex, Salary, Super_ssn, Dno)
employee-# VALUES ('Ahmad', 'V', 'Jabbar', '987987987', DATE '1969-03-29', '980 Dallas, Houston, TX', 'M', '25000', '987654321', '4'
INSERT 0 1
```

Placing Data Into the "DEPARTMENT" table

```
employee=# INSERT INTO DEPARTMENT  (Dname, Dnumber, Mgr_ssn, Mgr_start_date)
employee-# VALUES ('Research', '5', '333445555', DATE '1988-05-22'  );
INSERT 0 1
employee=# INSERT INTO DEPARTMENT  (Dname, Dnumber, Mgr_ssn, Mgr_start_date)
employee-# VALUES ('Administration', '4', '987654321', DATE '1955-01-01'  );
INSERT 0 1
employee=# INSERT INTO DEPARTMENT  (Dname, Dnumber, Mgr_ssn, Mgr_start_date)
employee-# VALUES ('Headquarters', '1', '888665555', DATE '1981-06-19'  );
INSERT 0 1
employee=#
```

Placing Data Into the "DEPT_LOCATIONS" table

```
employee=# INSERT INTO DEPT_LOCATIONS (Dnumber, Dlocation)
employee-# VALUES ('1', 'Houston' );
INSERT 0 1
employee=# INSERT INTO DEPT_LOCATIONS (Dnumber, Dlocation)
employee-# VALUES ('4', 'Stafford' );
INSERT 0 1
employee=# INSERT INTO DEPT_LOCATIONS (Dnumber, Dlocation)
employee-# VALUES ('5', 'Bellaire' );
INSERT 0 1
employee=# INSERT INTO DEPT_LOCATIONS (Dnumber, Dlocation)
employee-# VALUES ('5', 'Sugarland' );
INSERT 0 1
employee=# INSERT INTO DEPT_LOCATIONS (Dnumber, Dlocation)
employee-# VALUES ('5', 'Houston' );
INSERT 0 1
employee=#
```

Placing Data Into the "WORKS_ON" table

```
employee=# INSERT INTO WORKS_ON  (Essn, Pno, Hours)
employee-# VALUES ('123456789', '1', '32.5'  );
INSERT 0 1
employee=# INSERT INTO WORKS_ON  (Essn, Pno, Hours)
employee-# VALUES ('123456789', '2', '7.5'  );
INSERT 0 1
employee=# INSERT INTO WORKS_ON  (Essn, Pno, Hours)
employee-# VALUES ('666884444', '3', '40.0'  );
INSERT 0 1
employee=# INSERT INTO WORKS_ON  (Essn, Pno, Hours)
employee-# VALUES ('453453453', '1', '20.0'  );
INSERT 0 1
employee=# INSERT INTO WORKS_ON  (Essn, Pno, Hours)
employee-# VALUES ('453453453', '2', '20.0'  );
INSERT 0 1
employee=# INSERT INTO WORKS_ON  (Essn, Pno, Hours)
employee-# VALUES ('333445555', '2', '10.0'  );
INSERT 0 1
employee=# INSERT INTO WORKS_ON  (Essn, Pno, Hours)
employee-#  VALUES ('333445555', '3', '10.0'  );
INSERT 0 1
employee=# INSERT INTO WORKS_ON  (Essn, Pno, Hours)
employee-# VALUES ('333445555', '10', '10.0'  );
INSERT 0 1
employee=# INSERT INTO WORKS_ON  (Essn, Pno, Hours)
employee-# VALUES ('333445555', '20', '10.0'  );
INSERT 0 1
employee=# INSERT INTO WORKS_ON  (Essn, Pno, Hours)
employee-#  VALUES ('999887777', '30', '30.0'  );
INSERT 0 1
employee=# INSERT INTO WORKS_ON  (Essn, Pno, Hours)
employee-#  VALUES ('999887777', '10', '10.0'  );
INSERT 0 1
employee=# INSERT INTO WORKS_ON  (Essn, Pno, Hours)
employee-# VALUES ('987987987', '10', '35.0'  );
INSERT 0 1
employee=# INSERT INTO WORKS_ON  (Essn, Pno, Hours)
employee-# VALUES ('987987987', '30', '5.0'  );
INSERT 0 1
employee=# INSERT INTO WORKS_ON  (Essn, Pno, Hours)
employee-# VALUES ('987654321', '30', '20.0'  );
INSERT 0 1
employee=# INSERT INTO WORKS_ON  (Essn, Pno, Hours)
employee-# VALUES ('987654321', '20', '15.0'  );
INSERT 0 1
employee=# INSERT INTO WORKS_ON  (Essn, Pno, Hours)
employee-# VALUES ('888665555', '20', '0'  );
INSERT 0 1
employee=#
```

Placing Data Into the “PROJECT” table

Placing Data Into the “DEPENDENT” table

```
employee=# INSERT INTO DEPENDENT (Essn, Dependent_name, Sex, Bdate, Relationship)
employee-# VALUES  ('333445555', 'Alice', 'F', DATE '1986-04-05', 'Daughter'  );
INSERT 0 1
employee=# INSERT INTO DEPENDENT (Essn, Dependent_name, Sex, Bdate, Relationship)
employee-# VALUES  ('333445555', 'Theodore', 'M', DATE '1983-10-25', 'Son'  );
INSERT 0 1
employee=# INSERT INTO DEPENDENT (Essn, Dependent_name, Sex, Bdate, Relationship)
employee-# VALUES  ('333445555', 'Joy', 'F', DATE '1958-05-03', 'Spouse'  );
INSERT 0 1
employee=# INSERT INTO DEPENDENT (Essn, Dependent_name, Sex, Bdate, Relationship)
employee-# VALUES  ('987654321', 'Abner', 'M', DATE '1942-02-28', 'Spouse'  );
INSERT 0 1
employee=# INSERT INTO DEPENDENT (Essn, Dependent_name, Sex, Bdate, Relationship)
employee-# VALUES  ('123456789', 'Michael', 'M', DATE '1988-01-04', 'Son'  );
INSERT 0 1
employee=# INSERT INTO DEPENDENT (Essn, Dependent_name, Sex, Bdate, Relationship)
employee-# VALUES  ('123456789', 'Alice', 'F', DATE '1988-12-30', 'Daughter'  );
INSERT 0 1
employee=# INSERT INTO DEPENDENT (Essn, Dependent_name, Sex, Bdate, Relationship)
employee-# VALUES  ('123456789', 'Elizabeth', 'F', DATE '1967-05-05', 'Spouse'  );
INSERT 0 1
employee=#
```

SELECT statements showing the contents of all tables.

SELECT Statement Showing the Content of "EMPLOYEE" Table

```
employee=# SELECT * FROM EMPLOYEE;
  fname   | minit |  lname   |    ssn    |   bdate    |         address          | sex | salary | super_ssn | dno
----------+-------+----------+-----------+------------+--------------------------+-----+--------+-----------+-----
 John     | B     | Smith    | 123456789 | 1965-01-09 | 731 Fondren, Houston, TX | M   |  30000 | 333445555 |   5
 Franklin | T     | Wong     | 333445555 | 1955-12-08 | 638 Voss, Houston, TX    | M   |  40000 | 888665555 |   5
 Alicia   | J     | Zelaya   | 999887777 | 1968-01-19 | 3321 Castle, Spring, TX  | F   |  25000 | 987654321 |   4
 Jennifer | S     | Wallace  | 987654321 | 1941-06-20 | 291 Berry, Bellaire, TX  | F   |  43000 | 888665555 |   4
 Ramesh   | K     | Narayan  | 666884444 | 1962-09-15 | 975 Fire Oak, Humble, TX | M   |  38000 | 333445555 |   5
 Joyce    | A     | English  | 453453453 | 1972-07-31 | 5631 Rice, Houston, TX   | F   |  25000 | 333445555 |   5
 Ahmad    | V     | Jabbar   | 987987987 | 1969-03-29 | 980 Dallas, Houston, TX  | M   |  25000 | 987654321 |   4
 James    | E     | Borg     | 888665555 | 1937-11-10 | 450 Stone, Houston, TX   | M   |  55000 |         0 |   1
(8 rows)
```

SELECT Statement Showing the Content of "DEPARTMENT" Table

```
employee=# SELECT * FROM DEPARTMENT;
     dname      | dnumber |  mgr_ssn  | mgr_start_date
----------------+---------+-----------+----------------
 Research       |       5 | 333445555 | 1988-05-22
 Administration |       4 | 987654321 | 1955-01-01
 Headquarters   |       1 | 888665555 | 1981-06-19
(3 rows)
```

SELECT Statement Showing the Content of "DEPT_LOCATIONS" Table

```
employee=# SELECT * FROM DEPT_LOCATIONS;
 dnumber | dlocation
---------+-----------
       1 | Houston
       4 | Stafford
       5 | Bellaire
       5 | Sugarland
       5 | Houston
(5 rows)
```

SELECT Statement Showing the Content of "WORKS_ON" Table

```
employee=# SELECT * FROM WORKS_ON;
   essn    | pno | hours
-----------+-----+-------
 123456789 |   1 |  32.5
 123456789 |   2 |   7.5
 666884444 |   3 |    40
 453453453 |   1 |    20
 453453453 |   2 |    20
 333445555 |   2 |    10
 333445555 |   3 |    10
 333445555 |  10 |    10
 333445555 |  20 |    10
 999887777 |  30 |    30
 999887777 |  10 |    10
 987987987 |  10 |    35
 987987987 |  30 |     5
 987654321 |  30 |    20
 987654321 |  20 |    15
 888665555 |  20 |     0
(16 rows)
```

SELECT Statement Showing the Content of "PROJECT" Table

```
employee=# SELECT * FROM PROJECT;
      pname       | pnumber | plocation | dnum
------------------+---------+-----------+------
 ProductX         |       1 | Bellaire  |    5
 ProductY         |       2 | Sugarland |    5
 ProductZ         |       3 | Houston   |    5
 Computerization  |      10 | Stafford  |    4
 Reorganization   |      20 | Houston   |    1
 Newbenefits      |      30 | Stafford  |    4
(6 rows)
```

SELECT Statement Showing the Content of "DEPENDENT" Table

```
employee=# SELECT * FROM DEPENDENT;
   essn    | dependent_name | sex |   bdate    | relationship
-----------+----------------+-----+------------+--------------
 333445555 | Alice          | F   | 1986-04-05 | Daughter
 333445555 | Theodore       | M   | 1983-10-25 | Son
 333445555 | Joy            | F   | 1958-05-03 | Spouse
 987654321 | Abner          | M   | 1942-02-28 | Spouse
 123456789 | Michael        | M   | 1988-01-04 | Son
 123456789 | Alice          | F   | 1988-12-30 | Daughter
 123456789 | Elizabeth      | F   | 1967-05-05 | Spouse
(7 rows)
```

Each SQL query and the corresponding results for each query, from section 8.5.

SQL Query and Result for Query #1

```
employee=# SELECT fname, lname, address
employee-# FROM employee, department
employee-# WHERE dname='Research' AND dnumber=dno;
  fname   |  lname  |         address
----------+---------+-------------------------
 John     | Smith   | 731 Fondren, Houston, TX
 Franklin | Wong    | 638 Voss, Houston, TX
 Ramesh   | Narayan | 975 Fire Oak, Humble, TX
 Joyce    | English | 5631 Rice, Houston, TX
(4 rows)
```

SQL Query and Result for Query #2

```
employee=# SELECT pnumber, dnum, lname, address, bdate
employee-# FROM project, department, employee
employee-# WHERE dnum=dnumber AND mgr_ssn=ssn AND plocation='Stafford';
 pnumber | dnum |  lname  |         address         |   bdate
---------+------+---------+-------------------------+------------
      10 |    4 | Wallace | 291 Berry, Bellaire, TX | 1941-06-20
      30 |    4 | Wallace | 291 Berry, Bellaire, TX | 1941-06-20
(2 rows)
```

SQL Query and Result for Query #3

```
employee=# Select fname,lname
employee-# from Employee
employee-# where not exists
employee-# ((select pnumber from Project where dnum = 5)
employee(# except
employee(# (select pno from Works_On where ssn = essn));
 fname | lname
-------+-------
(0 rows)
```

SQL Query and Result for Query #4

```
employee=# (SELECT DISTINCT(pnumber)
employee(# FROM project, department, employee
employee(# WHERE dnum=dnumber AND mgr_ssn=ssn AND lname='Smith')
employee-# UNION
employee-# (SELECT DISTINCT(pnumber)
employee(# FROM project, works_on, employee
employee(# WHERE pnumber=pno AND essn=ssn AND lname= 'Smith');
 pnumber
---------
       1
       2
(2 rows)
```

SQL Query and Result for Query #5

```
employee=# SELECT LNAME, FNAME
employee-# FROM EMPLOYEE
employee-# WHERE (SELECT COUNT (*)
employee(# FROM DEPENDENT
employee(# WHERE SSN = ESSN) >= 2;
 lname |  fname
-------+---------
 Smith | John
 Wong  | Franklin
(2 rows)
```

SQL Query and Result for Query #6

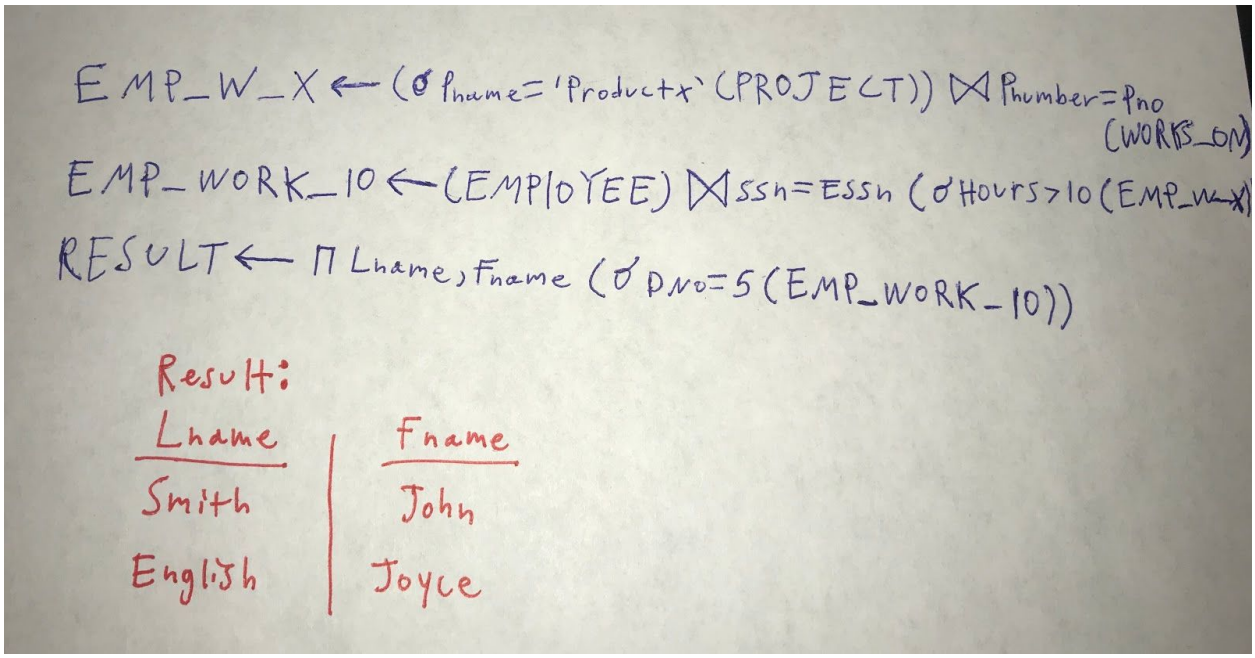
```
employee=# SELECT FNAME, LNAME
employee-# FROM EMPLOYEE
employee-# WHERE NOT EXISTS (SELECT *
employee(# FROM DEPENDENT
employee(# WHERE SSN = ESSN);
 fname  |  lname
--------+---------
 Alicia | Zelaya
 Ramesh | Narayan
 Joyce  | English
 Ahmad  | Jabbar
 James  | Borg
(5 rows)
```

SQL Query and Result for Query #7

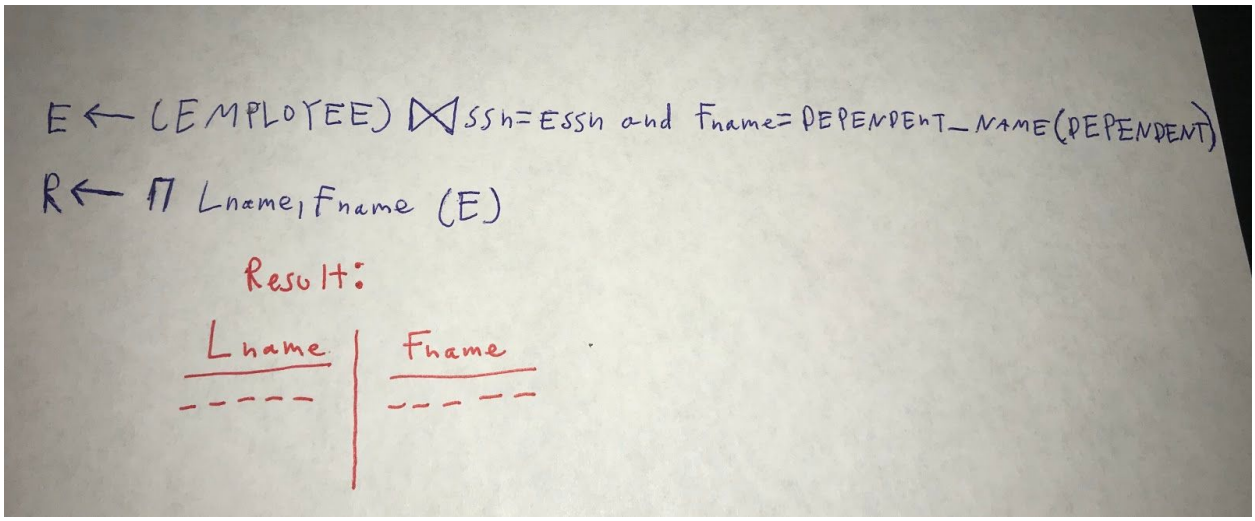
```
employee=# SELECT FNAME, LNAME
FROM EMPLOYEE
WHERE EXISTS (SELECT *
FROM DEPENDENT
WHERE SSN = ESSN)
AND
EXISTS (SELECT *
FROM DEPARTMENT
WHERE SSN = DEPARTMENT.MGR_SSN);
   fname   |  lname
-----------+---------
 Franklin | Wong
 Jennifer | Wallace
(2 rows)
```

The relational expressions corresponding to each one of the queries.

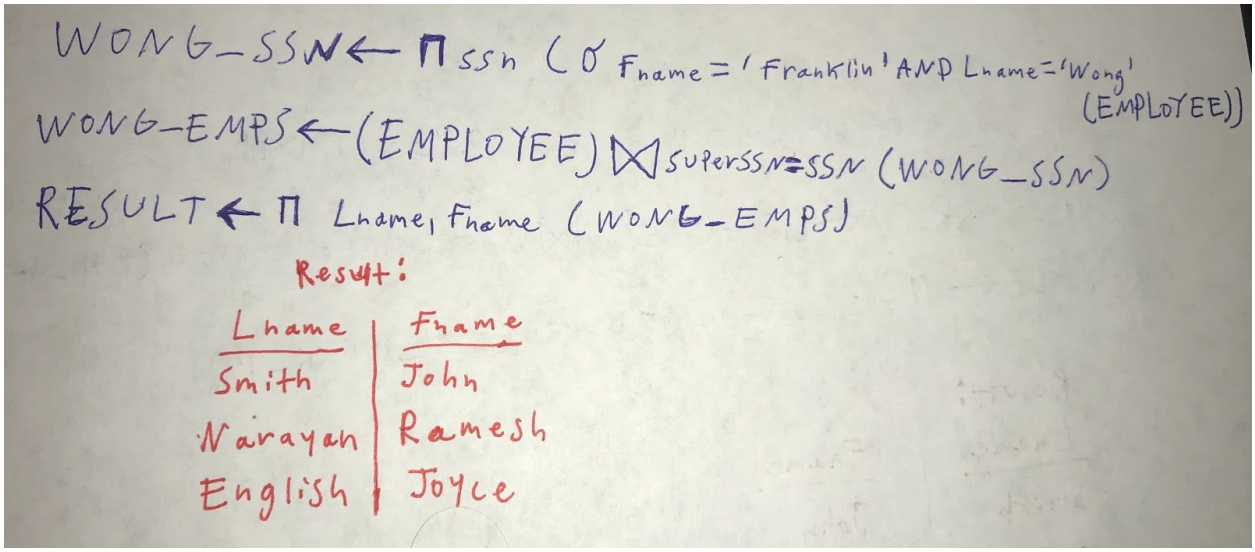
1. **Retrieve the names of all employees in department 5 who work more than 10 hours per week on the ProductX project.**



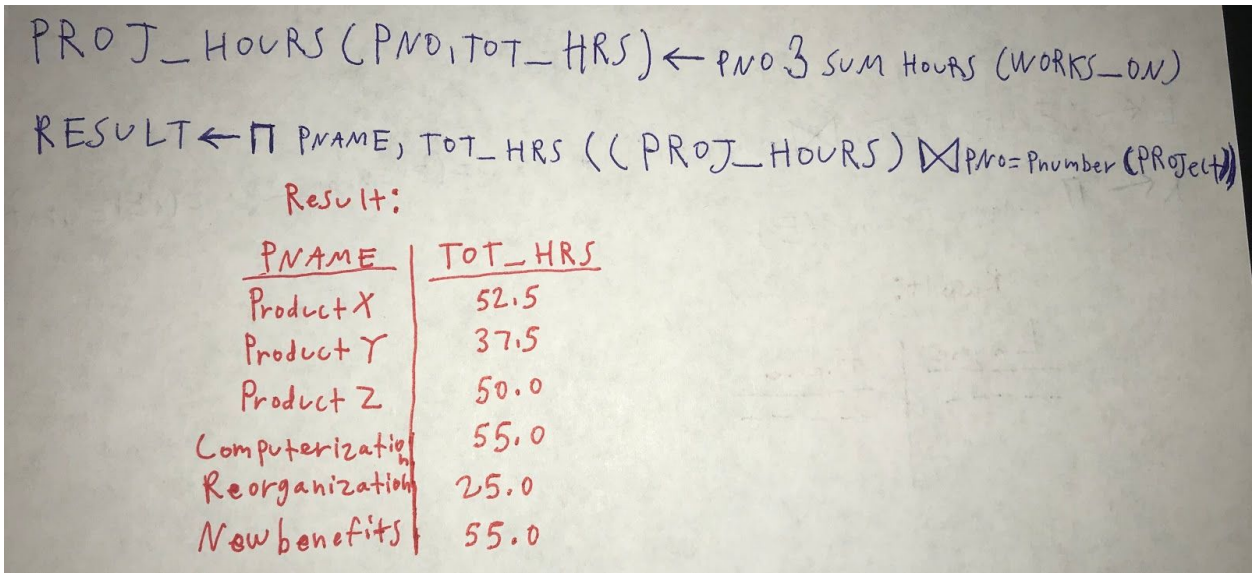
2. **List the names of all employees who have a dependent with the same first name as themselves.**



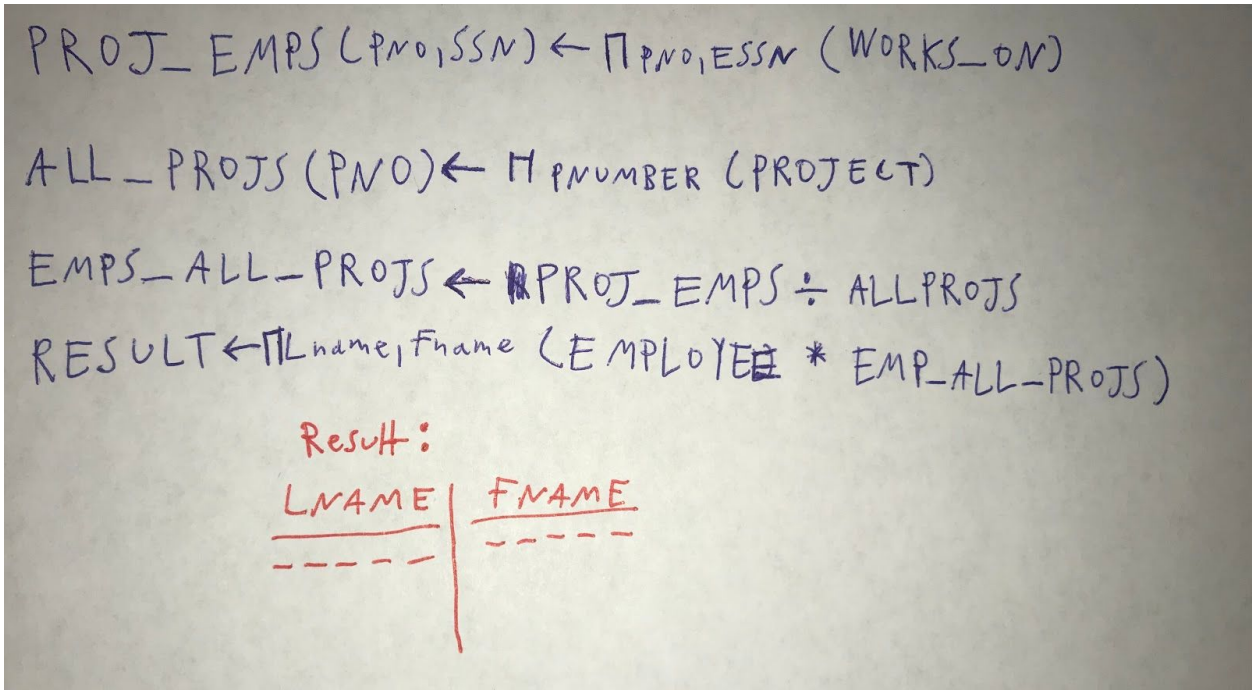
3. **Find the names of all employees who are directly supervised by 'Franklin Wong'.**



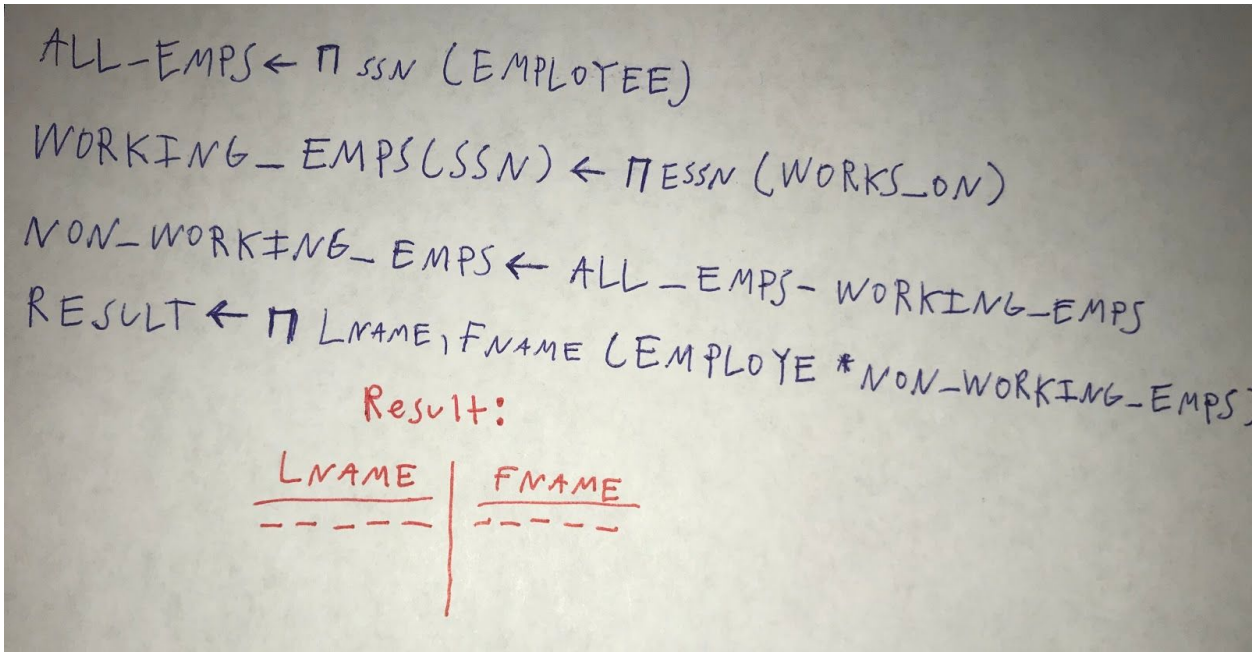
4. For each project, list the project name and the total hours per week (by all employees) spent on that project.



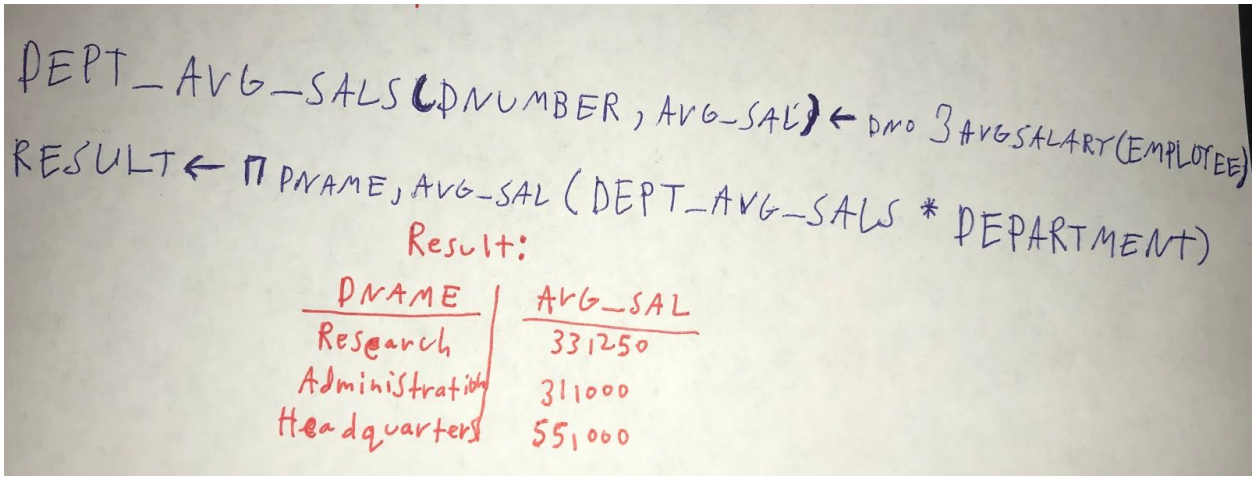
5. Retrieve the names of all employees who work on every project.



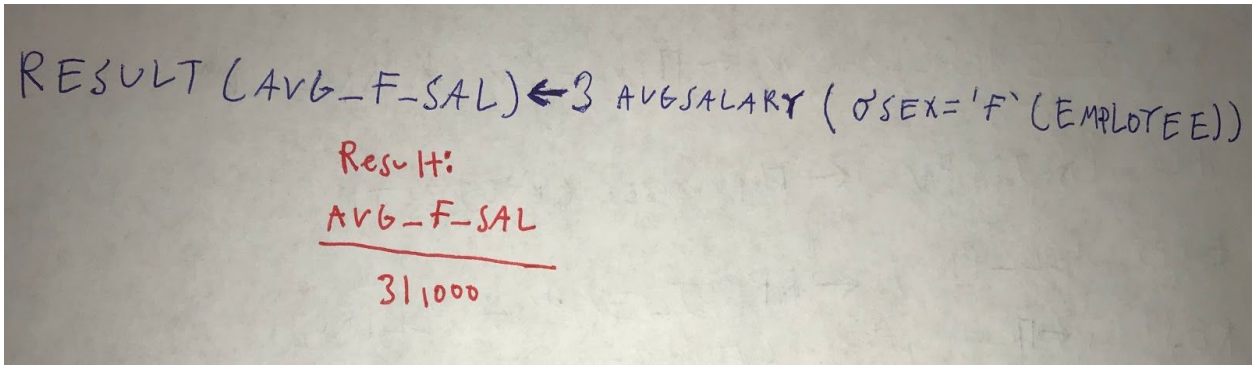
6. **Retrieve the names of all employees who do not work on any project.**



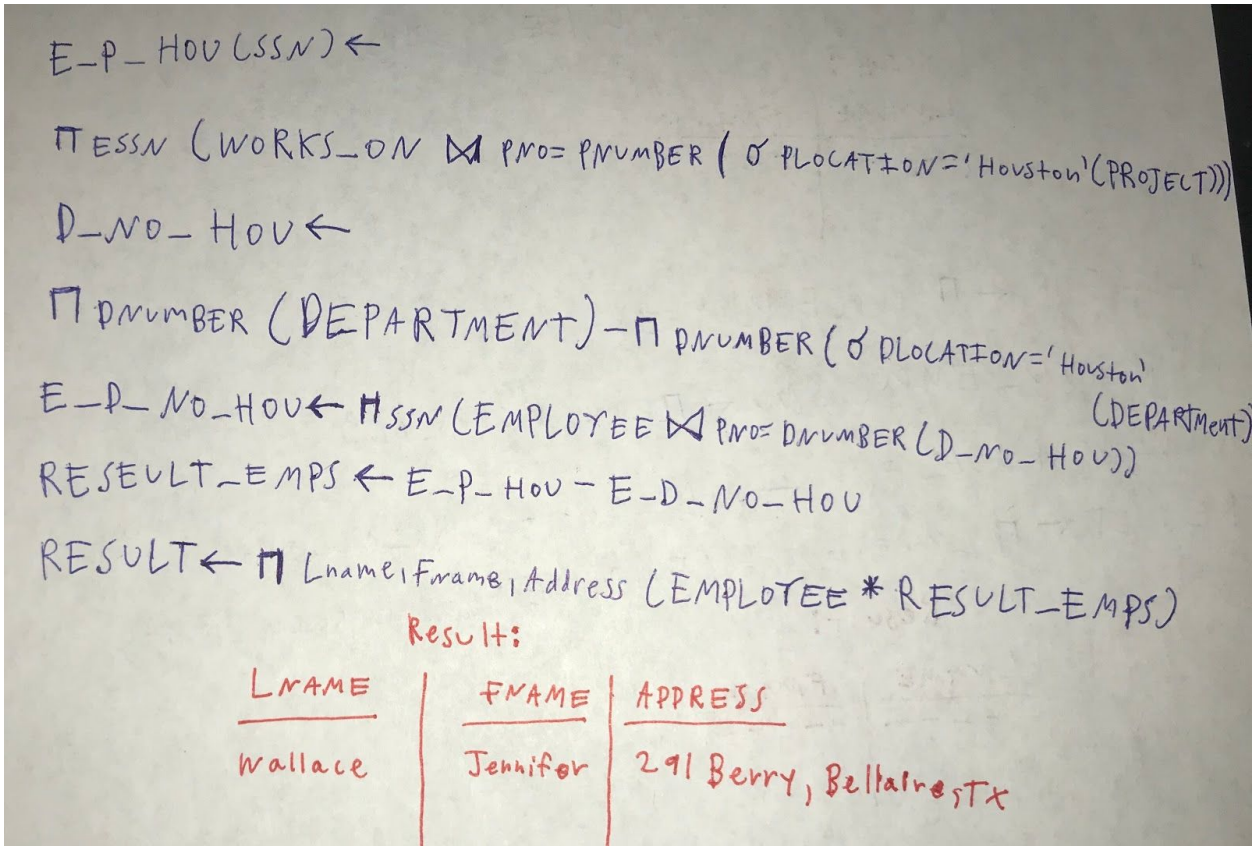
7. **For each department, retrieve the department name and the average salary of all employees working in that department.**



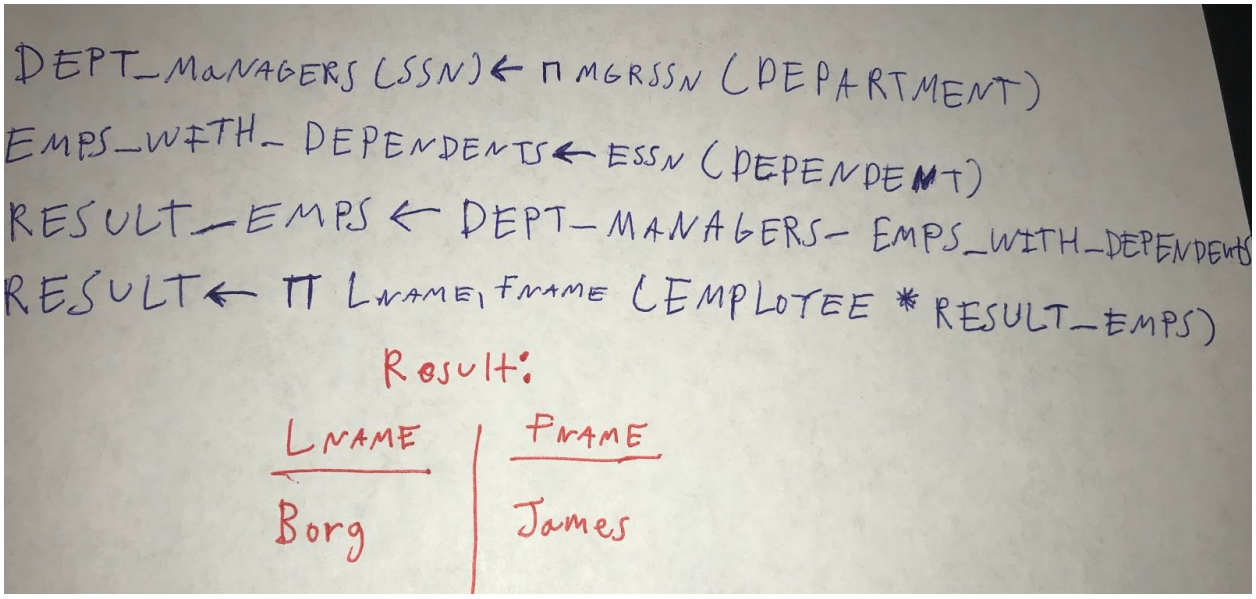
8. Retrieve the average salary of all female employees.



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.



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



References

Silberschatz, A., Galvin, P. B., & Gagne, G. (2018). Operating system concepts. Hoboken, N.J: Wiley.