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CPE 231 **Homework Assignment 4** **Due 16 Nov 2020**

The Figure 1 shows a relational database schema that we call COMPANY = {EMPLOYEE, DEPARTMENT, DEPT_LOCATIONS, PROJECT, WORKS_ON, DEPENDENT}. In each relation schema, the underlined attribute represents the primary key.

EMPLOYEE

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date

DEPT_LOCATIONS

Dnumber	Dlocation

PROJECT

Pname	Pnumber	Plocation	Dnum

WORKS_ON

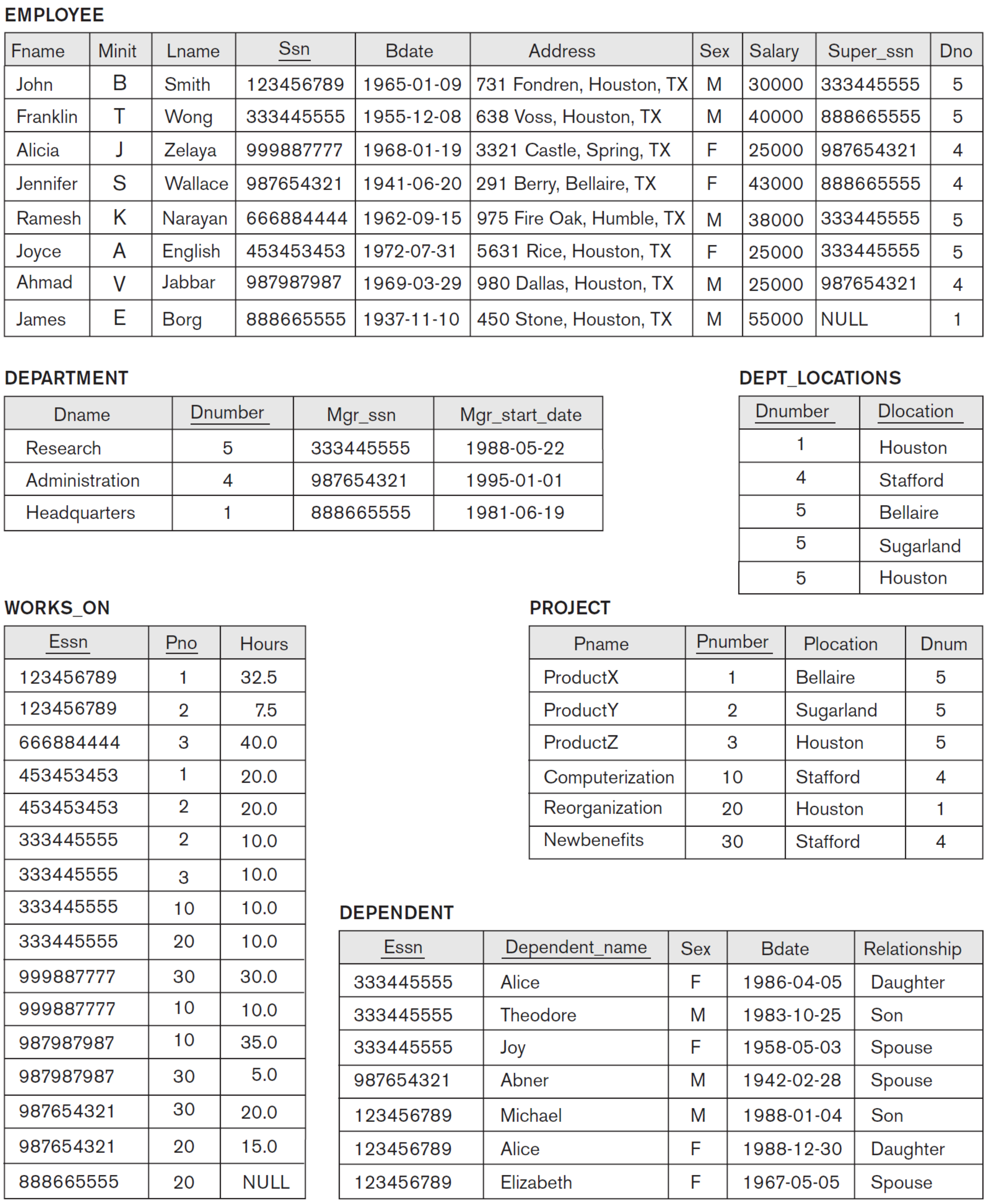
Essn	Pno	Hours

DEPENDENT

Essn	Dependent_name	Sex	Bdate	Relationship

Figure 1. Schema diagram for the COMPANY relational database schema.

When we refer to a relational database, we implicitly include both its schema and its current state. Figure 2 shows a relational database state corresponding to the COMPANY schema.



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	NULL	1

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date
Research	5	333445555	1988-05-22
Administration	4	987654321	1995-01-01
Headquarters	1	888665555	1981-06-19

DEPT_LOCATIONS

Dnumber	Dlocation
1	Houston
4	Stafford
5	Bellaire
5	Sugarland
5	Houston

WORKS_ON

Essn	Pno	Hours
123456789	1	32.5
123456789	2	7.5
666884444	3	40.0
453453453	1	20.0
453453453	2	20.0
333445555	2	10.0
333445555	3	10.0
333445555	10	10.0
333445555	20	10.0
999887777	30	30.0
999887777	10	10.0
987987987	10	35.0
987987987	30	5.0
987654321	30	20.0
987654321	20	15.0
888665555	20	NULL

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

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

Figure 2. One possible database state for the COMPANY relational database schema.

1. Specify the following queries on the database in Figure 1 in SQL. Show the query results if each query is applied to the database state in Figure 2.

a. For each department whose average employee salary is more than $30,000, retrieve the department name and the number of employees working for that department.

b. Suppose that we want the number of male employees in each department making more than $30,000, rather than all employees (as in a). Can we specify this query in SQL? Why or why not?

2. In SQL, specify the following queries on the database in Figure 1 using the concept of nested queries and other concepts described in this chapter.

a. Retrieve the names of all employees who work in the department that has the employee with the highest salary among all employees.

b. b. Retrieve the names of all employees whose supervisor's supervisor has '888665555' for Ssn.

c. Retrieve the names of employees who make at least $10,000 more than the employee who is paid the least in the company.

3. Specify the following views in SQL on the COMPANY database schema shown in Figure 1.

a. A view that has the department name, manager name, and manager salary for every department.

b. A view that has the employee name, supervisor name, and employee salary for each employee who works in the 'Research' department.

c. A view that has the project name, controlling department name, number of employees, and total hours worked per week on the project for each project.

d. A view that has the project name, controlling department name, number of employees, and total hours worked per week on the project for each project with *more than one employee working on it*.

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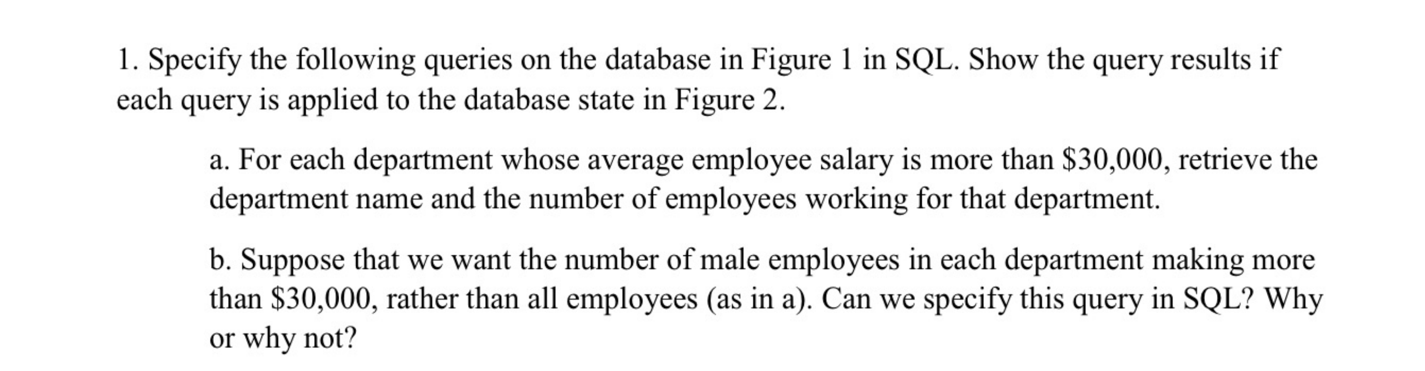

1. Specify the following queries on the database in Figure 1 in SQL. Show the query results if each query is applied to the database state in Figure 2.

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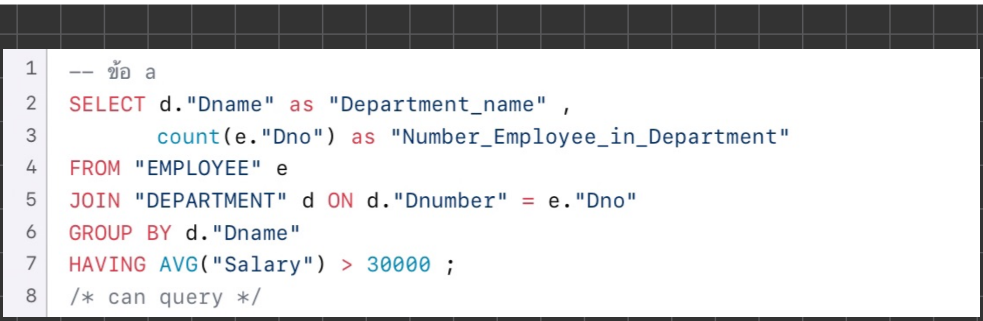
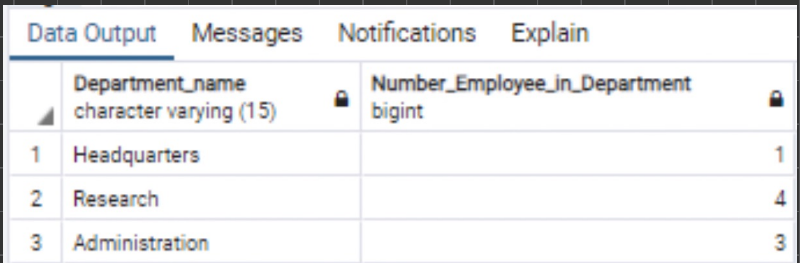


```
-- ข้อ a
SELECT d."Dname" as "Department_name" ,
       count(e."Dno") as "Number_Employee_in_Department"
FROM "EMPLOYEE" e
JOIN "DEPARTMENT" d ON d."Dnumber" = e."Dno"
GROUP BY d."Dname"
HAVING AVG("Salary") > 30000 ;
/* can query */
```



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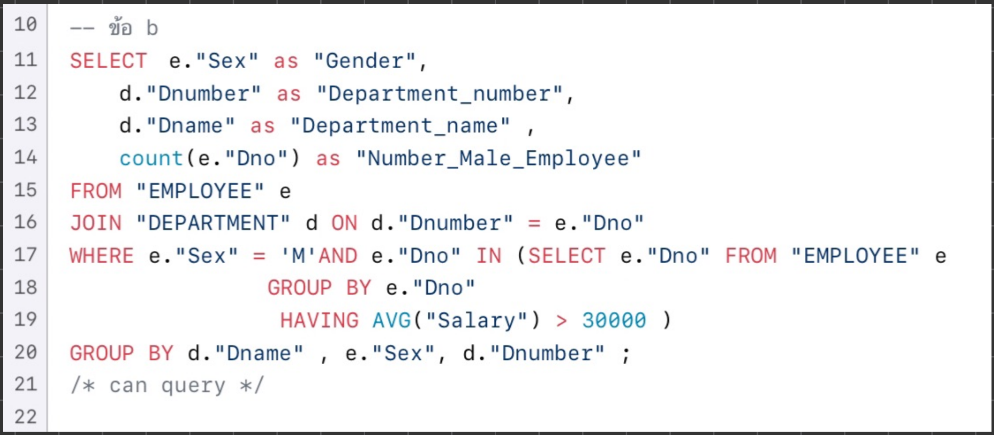
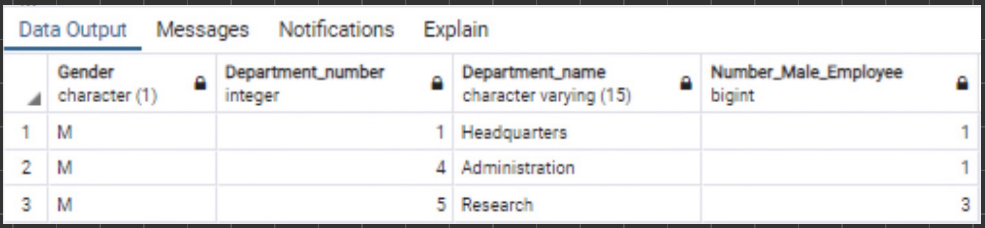
Data Output | Messages | Notifications | Explain

	Department_name character varying (15)	Number_Employee_in_Department bigint
1	Headquarters	1
2	Research	4
3	Administration	3



```
-- ข้อ b
SELECT  e."Sex" as "Gender",
    d."Dnumber" as "Department_number",
    d."Dname" as "Department_name" ,
    count(e."Dno") as "Number_Male_Employee"
FROM "EMPLOYEE" e
JOIN "DEPARTMENT" d ON d."Dnumber" = e."Dno"
WHERE e."Sex" = 'M'AND e."Dno" IN (SELECT e."Dno" FROM "EMPLOYEE" e
                GROUP BY e."Dno"
                 HAVING AVG("Salary") > 30000 )
GROUP BY d."Dname" , e."Sex", d."Dnumber" ;
/* can query */
```



ผลการ run คำตอบ

Data Output | Messages | Notifications | Explain

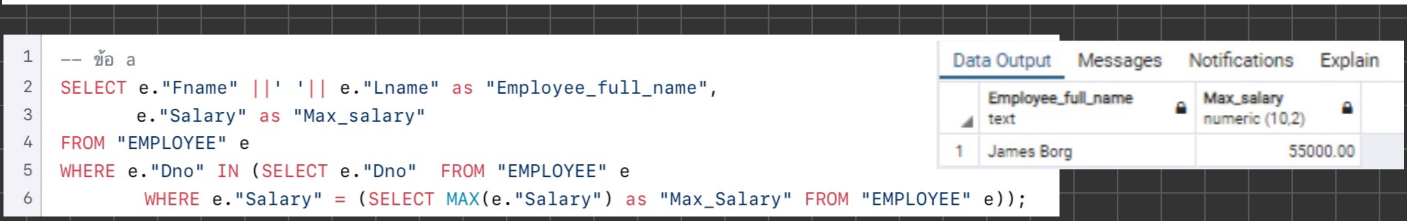
	Gender character (1)	Department_number integer	Department_name character varying (15)	Number_Male_Employee bigint
1	M	1	Headquarters	1
2	M	4	Administration	1
3	M	5	Research	3

2. In SQL, specify the following queries on the database in Figure 1 using the concept of nested queries and other concepts described in this chapter.

a. Retrieve the names of all employees who work in the department that has the employee with the highest salary among all employees.

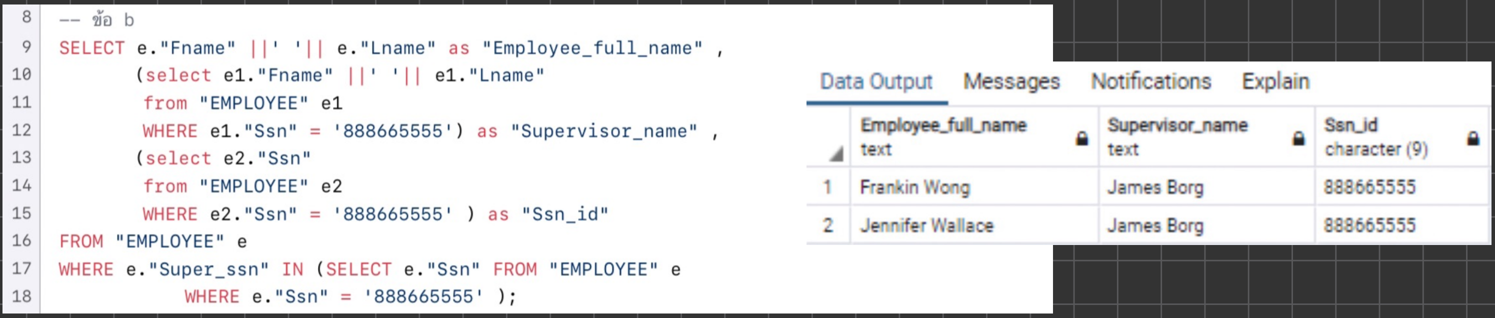
b. b. Retrieve the names of all employees whose supervisor's supervisor has '888665555' for Ssn.

c. Retrieve the names of employees who make at least $10,000 more than the employee who is paid the least in the company.



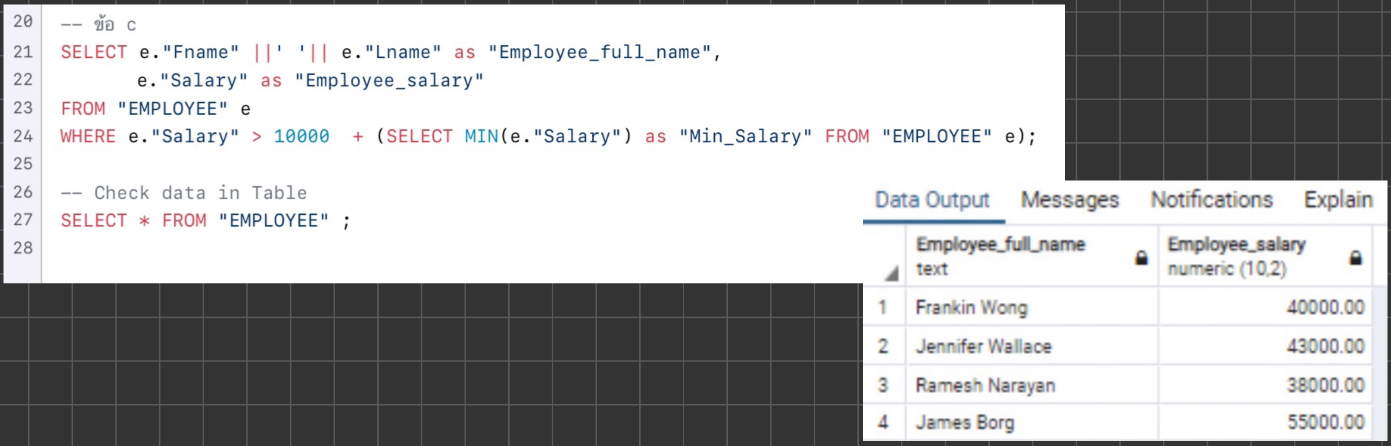
```
-- ข้อ a
SELECT e."Fname" ||' '|| e."Lname" as "Employee_full_name",
       e."Salary" as "Max_salary"
FROM "EMPLOYEE" e
WHERE e."Dno" IN (SELECT e."Dno"  FROM "EMPLOYEE" e
          WHERE e."Salary" = (SELECT MAX(e."Salary") as "Max_Salary" FROM "EMPLOYEE" e));
```

	Employee_full_name text	Max_salary numeric (10,2)
1	James Borg	55000.00



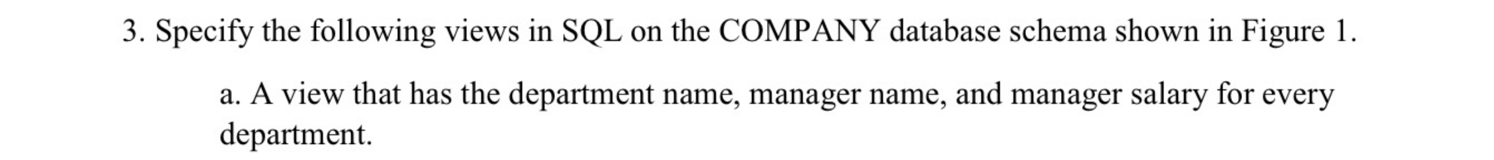
```
-- ข้อ b
SELECT e."Fname" ||' '|| e."Lname" as "Employee_full_name" ,
       (select e1."Fname" ||' '|| e1."Lname"
        from "EMPLOYEE" e1
        WHERE e1."Ssn" = '888665555') as "Supervisor_name" ,
       (select e2."Ssn"
        from "EMPLOYEE" e2
        WHERE e2."Ssn" = '888665555' ) as "Ssn_id"
FROM "EMPLOYEE" e
WHERE e."Super_ssn" IN (SELECT e."Ssn" FROM "EMPLOYEE" e
           WHERE e."Ssn" = '888665555' );
```

	Employee_full_name text	Supervisor_name text	Ssn_id character (9)
1	Frankin Wong	James Borg	888665555
2	Jennifer Wallace	James Borg	888665555



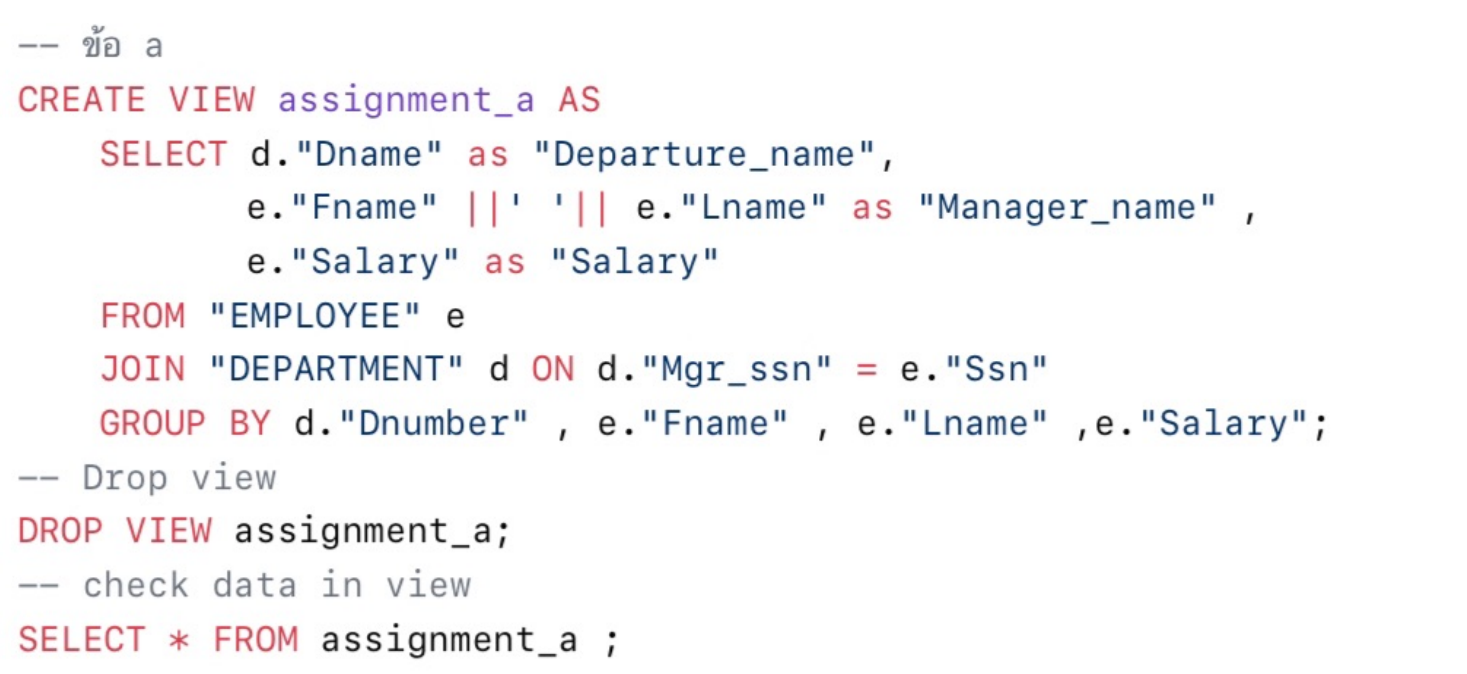
```
-- ข้อ c
SELECT e."Fname" ||' '|| e."Lname" as "Employee_full_name",
       e."Salary" as "Employee_salary"
FROM "EMPLOYEE" e
WHERE e."Salary" > 10000  + (SELECT MIN(e."Salary") as "Min_Salary" FROM "EMPLOYEE" e);

-- Check data in Table
SELECT * FROM "EMPLOYEE" ;
```

	Employee_full_name text	Employee_salary numeric (10,2)
1	Frankin Wong	40000.00
2	Jennifer Wallace	43000.00
3	Ramesh Narayan	38000.00
4	James Borg	55000.00

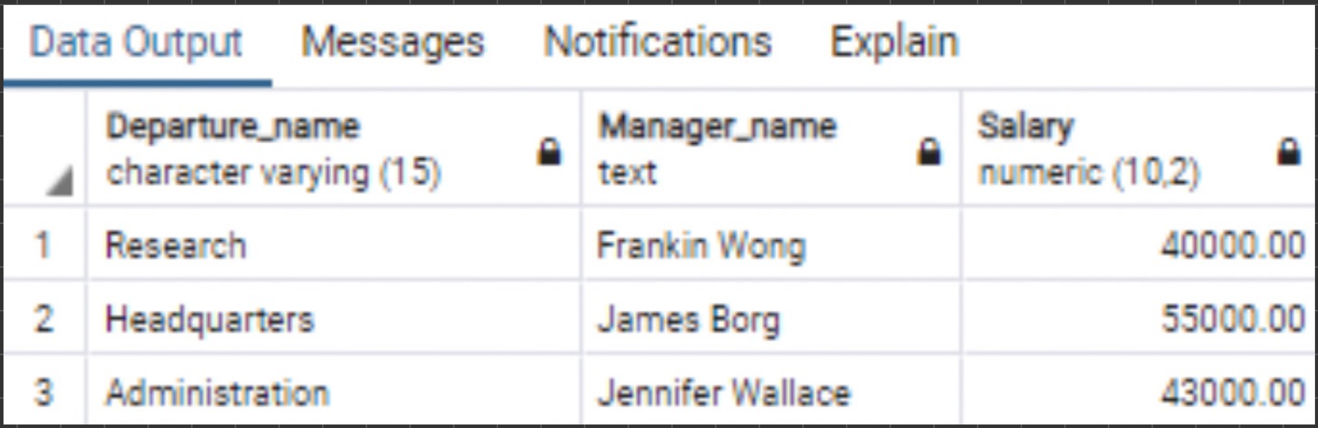


3. Specify the following views in SQL on the COMPANY database schema shown in Figure 1.

a. A view that has the department name, manager name, and manager salary for every department.

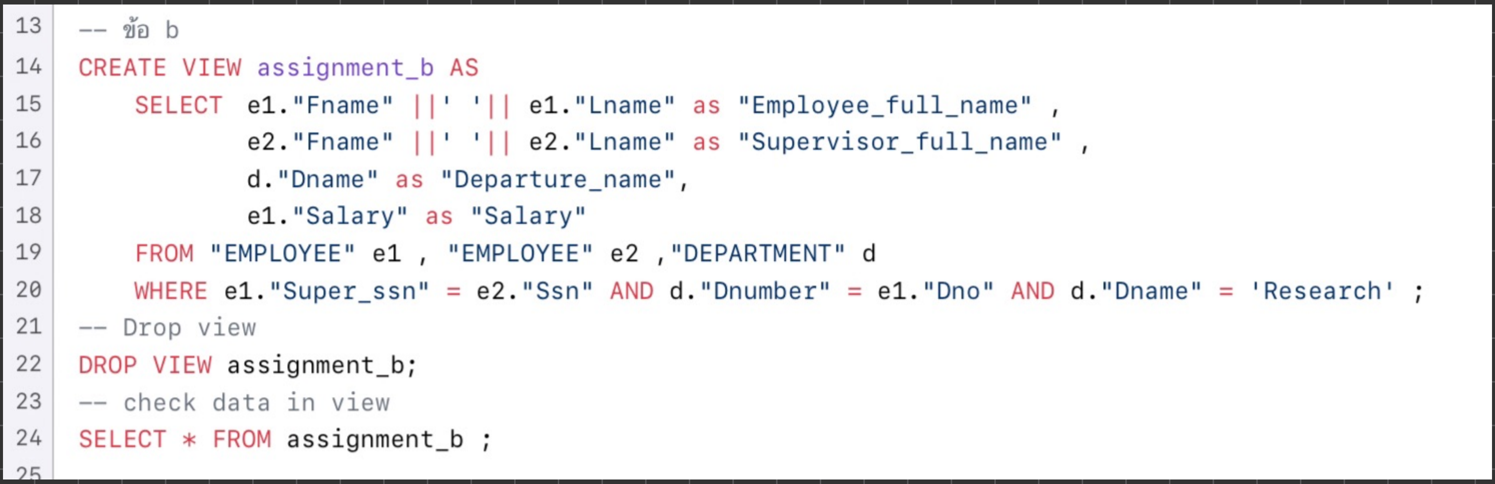


```
-- ข้อ a
CREATE VIEW assignment_a AS
    SELECT d."Dname" as "Departure_name",
           e."Fname" ||' '|| e."Lname" as "Manager_name" ,
           e."Salary" as "Salary"
    FROM "EMPLOYEE" e
    JOIN "DEPARTMENT" d ON d."Mgr_ssn" = e."Ssn"
    GROUP BY d."Dnumber" , e."Fname" , e."Lname" ,e."Salary";
-- Drop view
DROP VIEW assignment_a;
-- check data in view
SELECT * FROM assignment_a ;
```

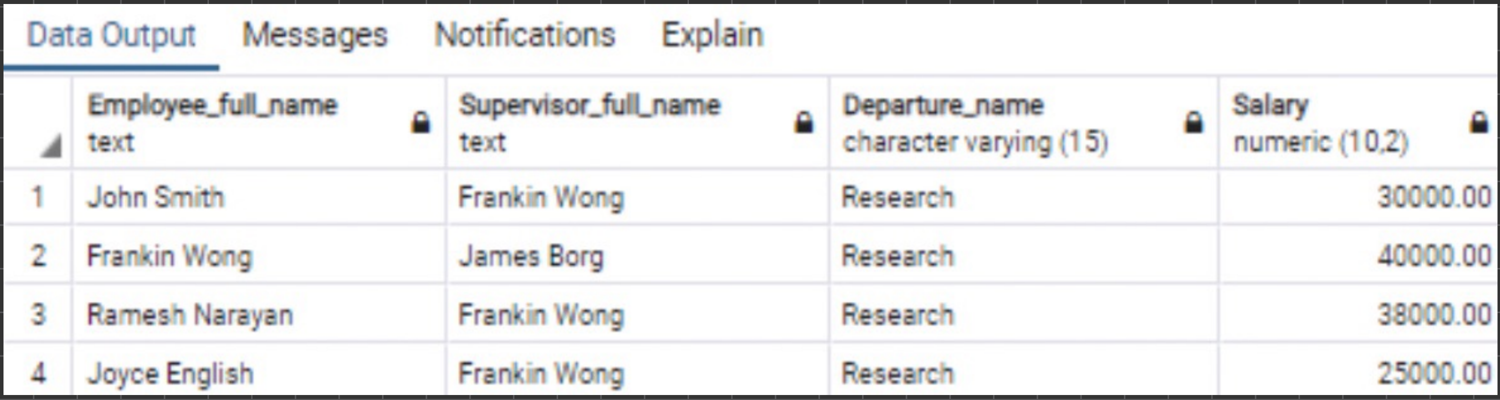


	Departure_name character varying (15)	Manager_name text	Salary numeric (10,2)
1	Research	Frankin Wong	40000.00
2	Headquarters	James Borg	55000.00
3	Administration	Jennifer Wallace	43000.00

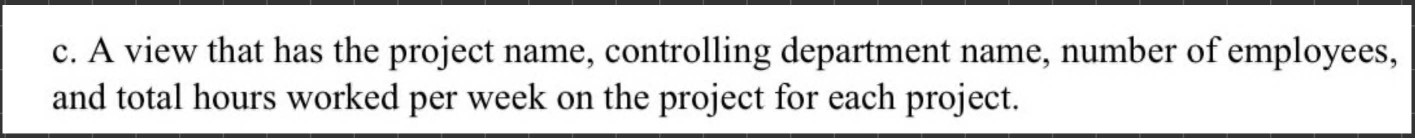
b. A view that has the employee name, supervisor name, and employee salary for each employee who works in the ‘Research’ department.



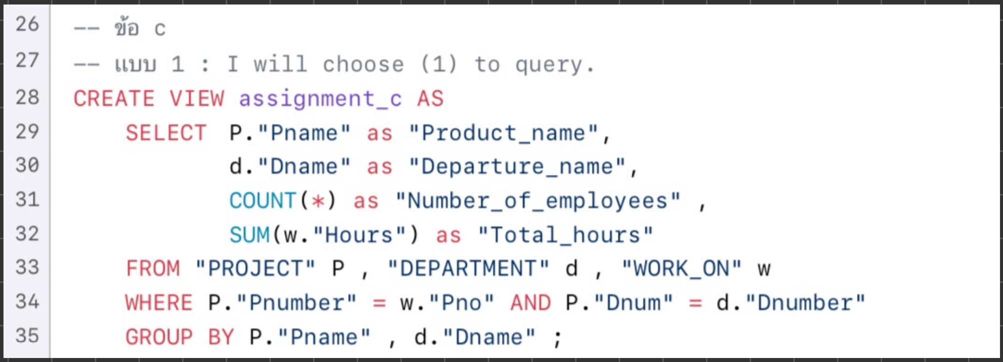
```
-- ข้อ b
CREATE VIEW assignment_b AS
    SELECT  e1."Fname" ||' '|| e1."Lname" as "Employee_full_name" ,
           e2."Fname" ||' '|| e2."Lname" as "Supervisor_full_name" ,
           d."Dname" as "Departure_name",
           e1."Salary" as "Salary"
    FROM "EMPLOYEE" e1 , "EMPLOYEE" e2 ,"DEPARTMENT" d
    WHERE e1."Super_ssn" = e2."Ssn" AND d."Dnumber" = e1."Dno" AND d."Dname" = 'Research' ;
-- Drop view
DROP VIEW assignment_b;
-- check data in view
SELECT * FROM assignment_b ;
```



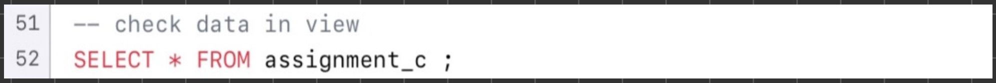
	Employee_full_name text	Supervisor_full_name text	Departure_name character varying (15)	Salary numeric (10,2)
1	John Smith	Frankin Wong	Research	30000.00
2	Frankin Wong	James Borg	Research	40000.00
3	Ramesh Narayan	Frankin Wong	Research	38000.00
4	Joyce English	Frankin Wong	Research	25000.00



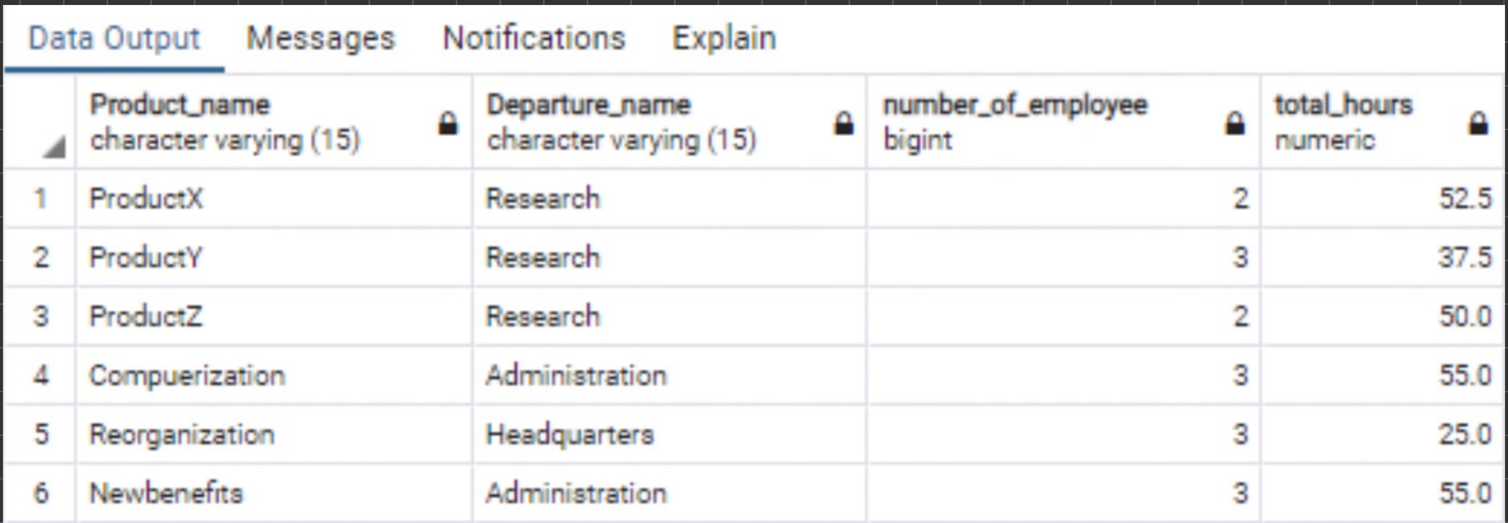
c. A view that has the project name, controlling department name, number of employees, and total hours worked per week on the project for each project.



```
-- ข้อ c
-- แบบ 1 : I will choose (1) to query.
CREATE VIEW assignment_c AS
    SELECT  P."Pname" as "Product_name",
            d."Dname" as "Departure_name",
            COUNT(*) as "Number_of_employees" ,
            SUM(w."Hours") as "Total_hours"
    FROM "PROJECT" P , "DEPARTMENT" d , "WORK_ON" w
    WHERE P."Pnumber" = w."Pno" AND P."Dnum" = d."Dnumber"
    GROUP BY P."Pname" , d."Dname" ;
```

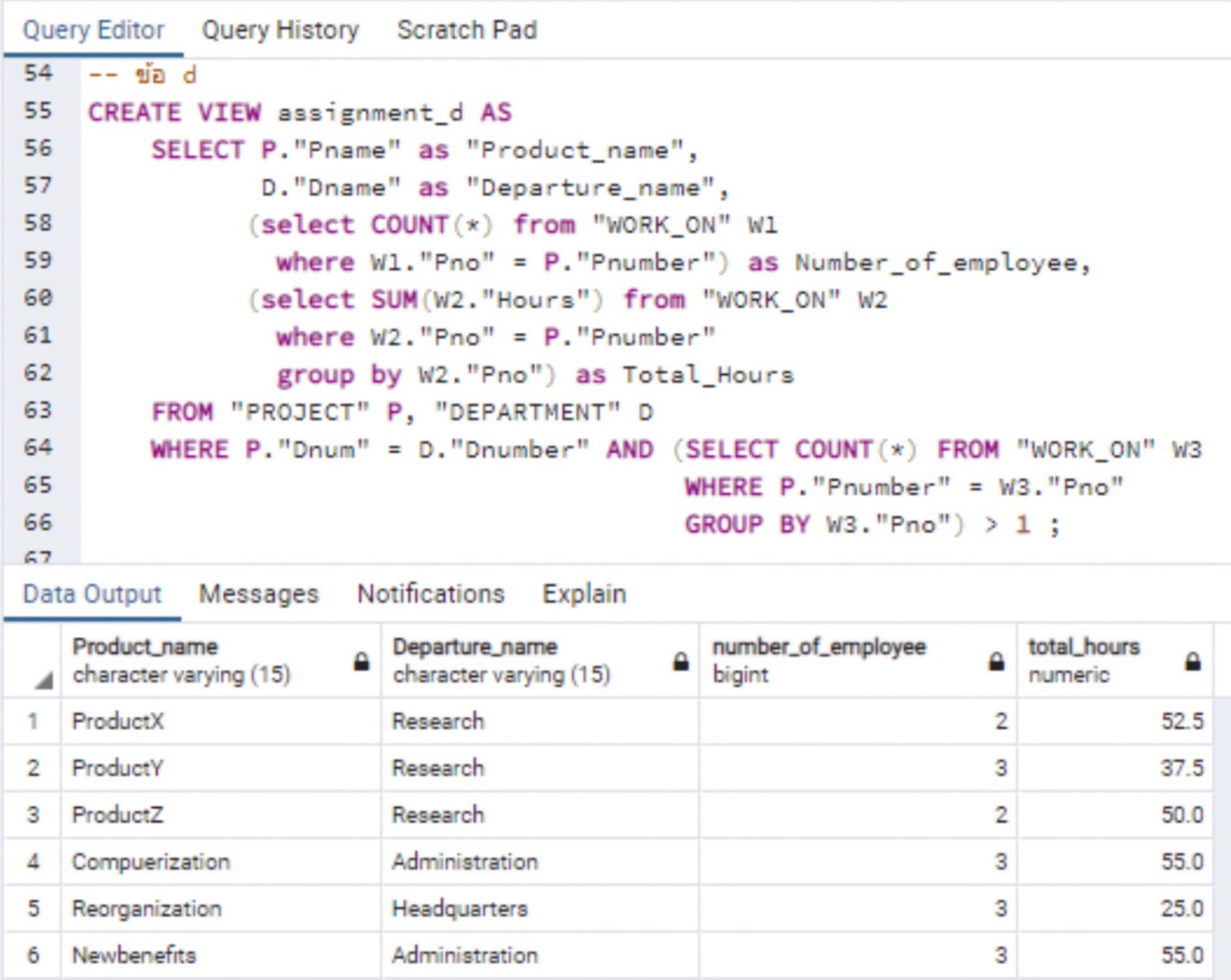


```
-- check data in view
SELECT * FROM assignment_c ;
```



	Product_name character varying (15)	Departure_name character varying (15)	number_of_employee bigint	total_hours numeric
1	ProductX	Research	2	52.5
2	ProductY	Research	3	37.5
3	ProductZ	Research	2	50.0
4	Compuerization	Administration	3	55.0
5	Reorganization	Headquarters	3	25.0
6	Newbenefits	Administration	3	55.0

d. A view that has the project name, controlling department name, number of employees, and total hours worked per week on the project for each project with *more than one employee working on it*.



```
-- ข้อ d
CREATE VIEW assignment_d AS
    SELECT P."Pname" as "Product_name",
           D."Dname" as "Departure_name",
          (select COUNT(*) from "WORK_ON" W1
            where W1."Pno" = P."Pnumber") as Number_of_employee,
          (select SUM(W2."Hours") from "WORK_ON" W2
            where W2."Pno" = P."Pnumber"
            group by W2."Pno") as Total_Hours
    FROM "PROJECT" P, "DEPARTMENT" D
    WHERE P."Dnum" = D."Dnumber" AND (SELECT COUNT(*) FROM "WORK_ON" W3
                                      WHERE P."Pnumber" = W3."Pno"
                                      GROUP BY W3."Pno") > 1 ;
```

	Product_name character varying (15)	Departure_name character varying (15)	number_of_employee bigint	total_hours numeric
1	ProductX	Research	2	52.5
2	ProductY	Research	3	37.5
3	ProductZ	Research	2	50.0
4	Compuerization	Administration	3	55.0
5	Reorganization	Headquarters	3	25.0
6	Newbenefits	Administration	3	55.0