

# Tutorial 1

Relational Algebra  
Examples

**EMPLOYEE**

Fname	Minit	Lname	<u>Ssn</u>	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	<u>Dnumber</u>	Mgr_ssn	Mgr_start_date
Research	5	333445555	1988-05-22
Administration	4	987654321	1995-01-01
Headquarters	1	888665555	1981-06-19

**WORKS\_ON**

<u>Essn</u>	<u>Pno</u>	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	<u>Pnumber</u>	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**

<u>Essn</u>	<u>Dependent_name</u>	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

# Firstly...

- Fig 5.6 from Elmasri & Navathe.
  - One possible database state for the COMPANY relational database schema.

# Firstly...

- See the handout containing the tables
  - Employee
  - Department
  - Project
  - WorksOn
  - Dept\_locations
- Assume an new relation, DEP5\_EMPS
  - This is a selection of employees working in Department 5.
$$\text{DEP5\_EMPS} \leftarrow \sigma_{\text{DNO}=5} (\text{EMPLOYEE})$$

# Unary Relational Operations:

## RENAME

- The RENAME operator is denoted by  $\rho$  (rho)
- In some cases, we may want to *rename* the attributes of a relation or the relation name or both
  - Useful when a query requires multiple operations

# RENAME (contd.)

- The general RENAME operation  $\rho$  can be expressed by any of the following forms:
  - $\rho_S(B_1, B_2, \dots, B_n)(R)$  changes both:
    - the relation name to  $S$ , *and*
    - the column (attribute) names to  $B_1, B_1, \dots, B_n$
  - $\rho_S(R)$  changes:
    - the *relation name* only to  $S$
  - $\rho_{(B_1, B_2, \dots, B_n)}(R)$  changes:
    - the *column (attribute) names* only to  $B_1, B_1, \dots, B_n$

# RENAME (contd.)

– For convenience, we also use a *shorthand* for renaming attributes in an intermediate relation:

- If we write:

- $\text{RESULT} \leftarrow \pi_{\text{FNAME, LNAME, SALARY}}(\text{DEP5\_EMPS})$
- RESULT will have the *same attribute names* as DEP5\_EMPS (same attributes as EMPLOYEE)

- If we write:

- $\text{RESULT (F, M, L, S, B, A, SX, SAL, SU, DNO)} \leftarrow \rho_{\text{RESULT (F.M.L.S.B,A,SX,SAL,SU, DNO)}}(\text{DEP5\_EMPS})$
- The 10 attributes of DEP5\_EMPS are *renamed* to F, M, L, S, B, A, SX, SAL, SU, DNO, respectively

# UNION, INTERSECT, and DIFFERENCE

(a) STUDENT

Fn	Ln
Susan	Yao
Ramesh	Shah
Johnny	Kohler
Barbara	Jones
Amy	Ford
Jimmy	Wang
Ernest	Gilbert

INSTRUCTOR

Fname	Lname
John	Smith
Ricardo	Browne
Susan	Yao
Francis	Johnson
Ramesh	Shah

(b)

Fn	Ln
Susan	Yao
Ramesh	Shah
Johnny	Kohler
Barbara	Jones
Amy	Ford
Jimmy	Wang
Ernest	Gilbert
John	Smith
Ricardo	Browne
Francis	Johnson

(c)

Fn	Ln
Susan	Yao
Ramesh	Shah

(d)

Fn	Ln
Johnny	Kohler
Barbara	Jones
Amy	Ford
Jimmy	Wang
Ernest	Gilbert

(e)

Fname	Lname
John	Smith
Ricardo	Browne
Francis	Johnson

**Figure 6.4**

The set operations UNION, INTERSECTION, and MINUS. (a) Two union-compatible relations. (b)  $\text{STUDENT} \cup \text{INSTRUCTOR}$ . (c)  $\text{STUDENT} \cap \text{INSTRUCTOR}$ . (d)  $\text{STUDENT} - \text{INSTRUCTOR}$ . (e)  $\text{INSTRUCTOR} - \text{STUDENT}$ .

# Questions

For you to do



# Elmasri and Navathe

- Retrieve the name of the manager of each department.
- Retrieve the name and address of all employees who work for the 'Research' department.
- Retrieve the names of employees who have no dependents.
- Retrieve the social security numbers of all employees who either work in department 5 or directly supervise an employee who works in department 5.

# Converting SQL and Relational Calculus

- Connolly & Begg
  - Do the exercises from page 111
    - See handouts.
- Consider the following set of relations:
  - Hotel (hotelNo, hotelName, city)
  - Room (roomNo, hotelNo<sup>\*</sup>, type, price)
  - Booking (hotelNo<sup>\*</sup>, guestNo<sup>\*</sup>, dateFrom, dateTo, roomNo<sup>\*</sup>)
  - Guest (guestNo, guestName, guestAddress)

- Q 4.8. Handouts will be given in class.
- Elmasri & Navathe
  - Questions from Chapter 6.
- Sunderraman
  - Questions on Relational Calculus.