## **Tutorial 2 - Relational Algebra**

patients (pnum, pname, age) doctors (dnum, dname, rank) visits (pnum, dnum, date, diagnosis)

#### 1. Simple selection and projection

- Q1. Who are the patients 10 years old or younger?
- Q2. Who are the surgeons
- Q3. What are the phone numbers of doctors
- Q4. What are the phone numbers of surgeons

## 2. Set Operations

- Q5. Re-state the expression  $\sigma_{age \le 10 \lor age \ge 60}$  (*patients*) using set operations.
- Q6. Re-state the expression  $\sigma_{rank \neq surgeon \land rank \neq oculist}(doctors)$  using set operations without  $\neq$  and  $\land$
- Q7. Find all the patients who saw doctor 801 but not 802 (i.e. dnum=801, dnum≠802)

#### 3. Cartesian Product and Join

- Q8. Form peer groups for patients, where a peer group is a pair of patients where age difference is less than 10 years (can use the rename operator  $\rho_A(R)$ ).
- Q9. Who are the surgeons who visited the patient 101 (i.e. pnum = 101)?
- Q10. Who has seen a surgeon after April 11, 2001?
- Q11. Is there any non-surgeon doctors who performed a surgeon (a doctor performed a surgeon if the visit record shows diagnosis="operation" for him)?

# 4. Divison

Q12. Who has seen all the surgeons after April 11, 2001?

- Q13. Find all patients except for the youngest ones.
- Q14. Given two relation schemas R1(A,B) and R2(A), express division R1/R2 in terms of other RA operators.