

Databases

DBDMG - Politecnico di Torino

Relational Algebra / SQL (I)

Exercise 1. Given the relational schema including the following tables (primary keys are underlined):

MAGAZINE (MId, MName, Publisher)
ARTICLE (AId, Title, Topic, MId)

express the following queries in relational algebra and in SQL language:

- (a) Find the names of the magazines that have published at least one article about motorcycles.
- (b) Find the names of the magazines that have never published any article about motorcycles.
- (c) Find the names of the magazines that have only ever published articles about motorcycles.
- (d) Find the names of the magazines that publish articles about motorcycles or cars.
- (e) Find the names of the magazines that publish both articles about motorcycles and articles about cars.
- (f) Find the names of the magazines that have published at least two articles about motorcycles.
- (g) Find the names of the magazines that have published only one article about motorcycles (i.e., they may have published any number of articles about other topics).

Exercise 2. Given the relational schema including the following tables (primary keys are underlined):

SAILOR (SId, SName, Expertise, DateOfBirth)
BOOKING (SId, BId, Date)
BOAT (BId, BName, Color)

express the following queries in relational algebra and in SQL language:

- (a) Find the names of the sailors who have booked a red boat or a green boat.
- (b) Find the codes and the names of the sailors who have booked a red boat and a green boat.
- (c) Find the codes of the sailors who have never booked a red boat.
- (d) Find the codes and the names of the sailors who have never booked a red boat.
- (e) Find the codes and the names of the sailors who have booked at least two boats.
- (f) Find the codes and the names of the sailors who have booked at least three boats.

Exercise 3. Given the relational schema including the following tables (primary keys are underlined):

AIRCRAFT (AId, AName, MaximumRange)
CERTIFICATE (PIId, AId)
PILOT (PIId, PName, Salary)

express the following queries in relational algebra:

- (a) Find the codes and the names of the pilots who are qualified to fly on an aircraft that can cover distances greater than 5,000 km ($\text{MaximumRange} \geq 5,000$).
- (b) Find the codes and the names of the pilots who are qualified to fly on at least two aircrafts that can cover distances greater than 5,000 km.
- (c) Find the codes and the names of the pilots who are qualified to fly on at least two aircrafts that can cover distances greater than 5,000 km, and who are qualified to fly on a Boeing.

Introduction to Databases

Exercises - Relational algebra

1. Given the following relational schema

TOUR-GUIDE (GuideCode, Name, Surname, Nationality)
TYPE-OF_TOUR (TourTypeCode}, Monument, Duration, City)
GROUP (GroupCode, NumberOfParticipants, Language)
GUIDED-TOUR-CARRIED-OUT (GroupCode, Date, StartTime, TourTypeCode, GuideCode)

Write the following queries in relational algebra:

- a. For each Italian tour guide who has only guided types of tours lasting more than 2 hours, show name and surname of the guide.
- b. Show surname and nationality of the guides who have guided all types of tours.

2. Given the following relational schema

STUDENT (StudentID, Name, Surname, BirthDate)
LABORATORY (LabID, LabName, Capacity)
DEVICE (DeviceID, DeviceName, Type, LabID)
EXPERIMENT (DeviceID, StudentID, Date, Description, Category)

Write the following queries in relational algebra:

- a. Show the name of laboratories with a capacity greater than 10 people, where at least 2 experiments were performed on the same day with devices of type 'video camera'.

3. Given the following relational schema

TEENAGER (SSN, Name, Surname, BirthDate, CityOfResidence, Sex)
ACTIVITY (ActivityCode, AName, Description, Category)
SUMMER-CAMP (CampCode, CampName, City)
SUBSCRIPTION-TO-ACTIVITY-IN-SUMMER-CAMP (SSN, ActivityCode, CampCode, SubscriptionDate)

Write the following queries in relational algebra:

- a. Show the name and surname of the teenagers who subscribed on the same date (SubscriptionDate) to at least two different activities, which are organized by two distinct summer camps. located in the same city.

4. Given the following relational schema

DRUG (DrugCode, DrugName, Category)
PATIENT (PatientCode, PatientName, BirthDate)
DOCTOR (DoctorCode, DoctorName)
SALE (DrugCode, PatientCode, Date, DoctorCode, Quantity, Amount)

Write the following queries in relational algebra:

- a. Find the codes of patient that have bought at least two drugs of the same category in the same day.

5. Given the following relational schema

CUSTOMER (CustCode, CustName, Gender, AgeRange, CustCountry)
VACATION-RESORT (ResCode, ResName, ResType, Location, ResCountry)
RESERVATION (CustCode, StartDate, EndDate, ResCode)

Write the following queries in relational algebra:

- a. Find the codes of customers that reserved only resorts located in their country.

6. Given the following relational schema

PRODUCT (PCode, PName, Brand, Price)
SHOP (SCode, SName, DateOpening, City)
SALE (PCode, SCode, SaleStartDate, Duration, DiscountPercentage)

Write the following queries in relational algebra:

- a. Show the code and name of products of the “Puma” brand that have been on sale at least twice in the same shop with a discount higher than 60