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