Politecnico
di Torino

DBMG

Relational algebra exercises

Exercise 1a

Given the following relational schema

TOUR-GUIDE (GuideCode, Name, Surname, Nationality)

TYPE_OF_TOUR (TourTypeCode, Monument, Duration, City)

GROUP (GroupCode, NumberOfParticipants, Language)

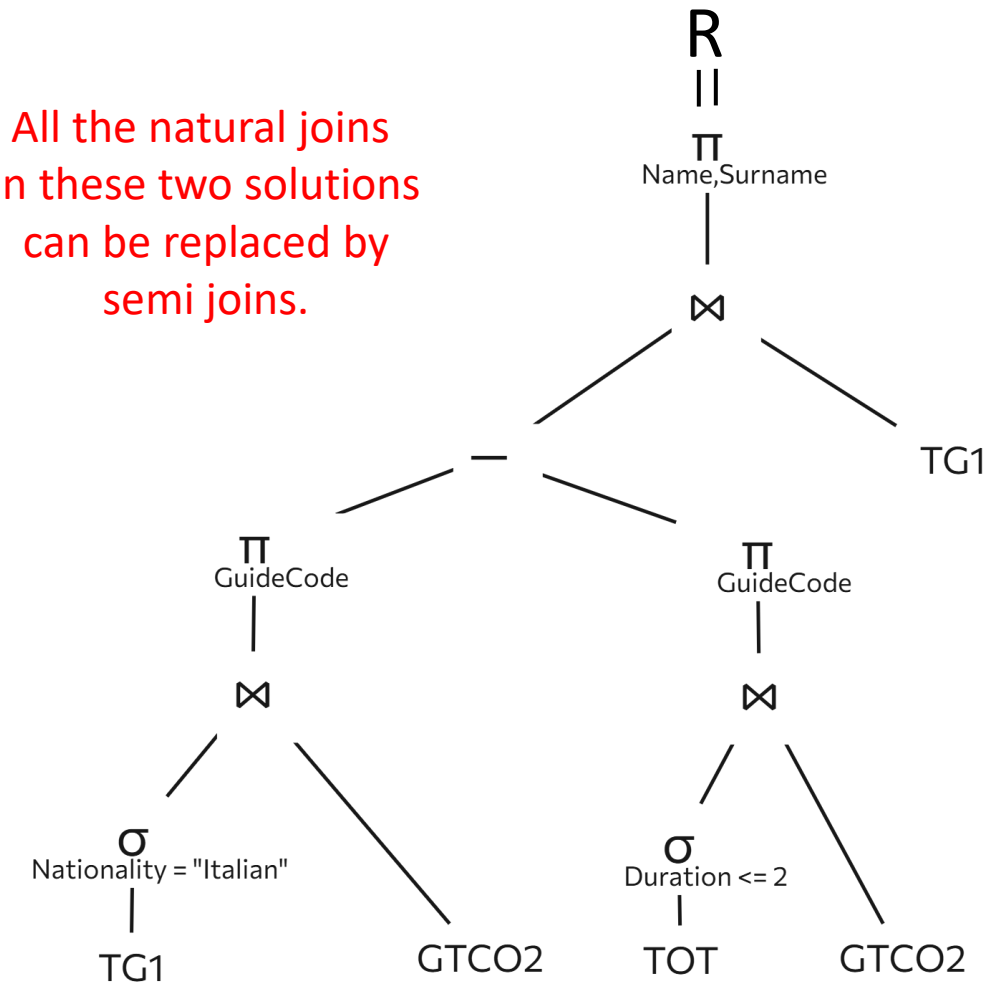
GUIDED-TOUR-CARRIED-OUT (GroupCode, Date, StartTime, TourTypeCode, GuideCode)

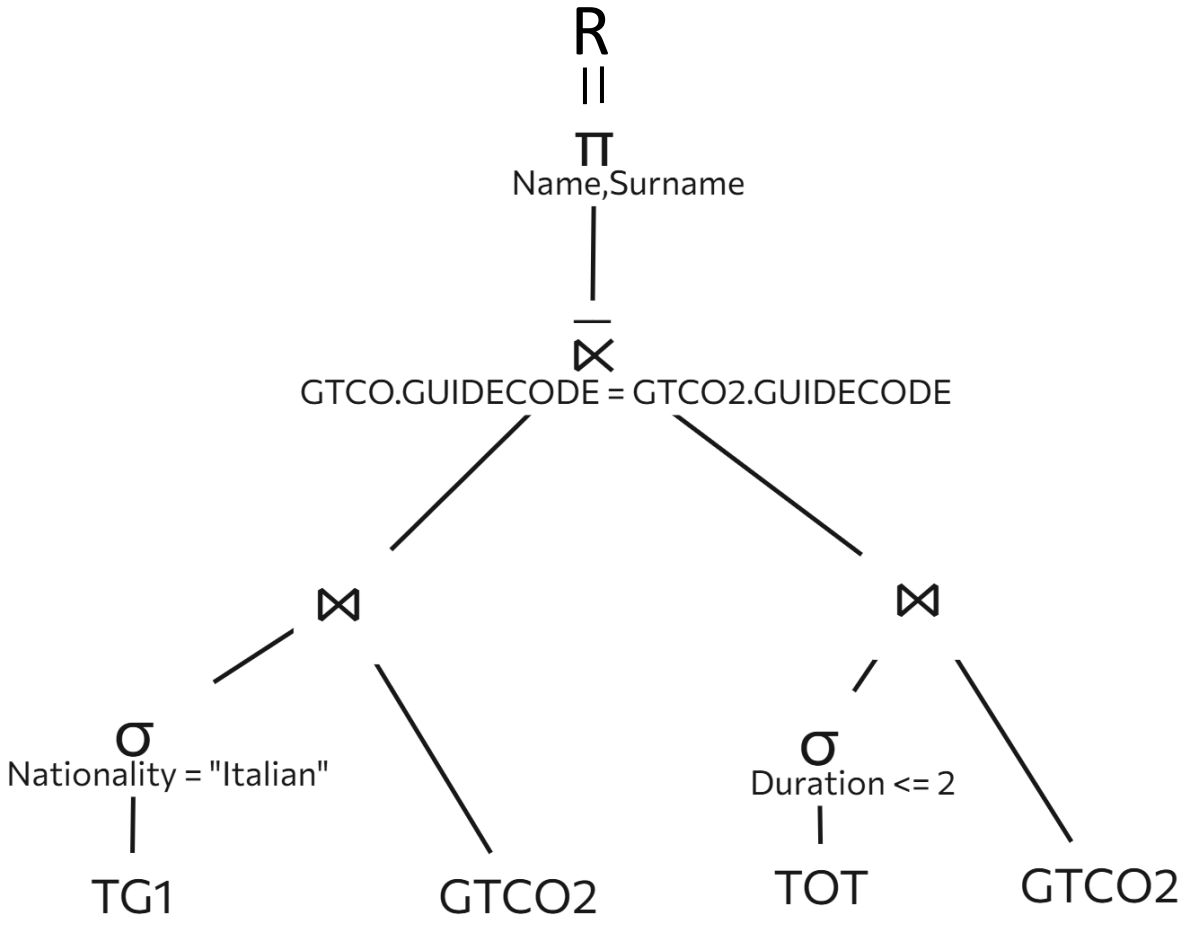
Write the following queries in relational algebra:

For each Italian tour guide who has only guided types of tours lasting more than 2 hours, show name and surname of the guide.

Exercise 1a

All the natural joins in these two solutions can be replaced by semi joins.





Exercise 1b

Given the following relational schema

TOUR-GUIDE (GuideCode, Name, Surname, Nationality)

TYPE_OF_TOUR (TourTypeCode, Monument, Duration, City)

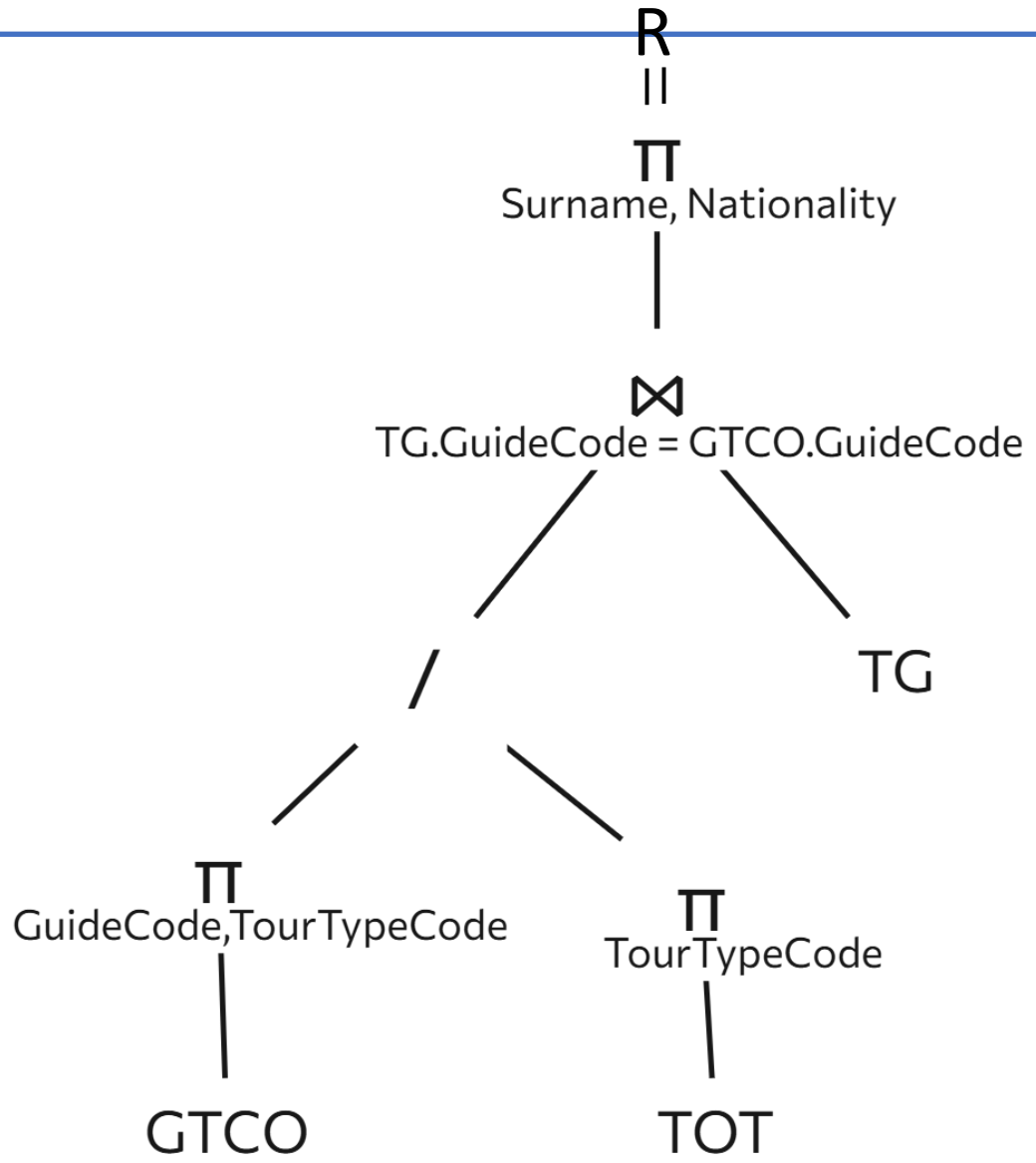
GROUP (GroupCode, NumberOfParticipants, Language)

GUIDED-TOUR-CARRIED-OUT (GroupCode, Date, StartTime, TourTypeCode, GuideCode)

Write the following queries in relational algebra:

Show surname and nationality of the guides who have guided all types of tours.

Exercise 1b


R
=
π
Surname, Nationality
⋈
TG.GuideCode = GTCO.GuideCode
/
TG
π
GuideCode,TourTypeCode
π
TourTypeCode
GTCO
TOT

Exercise 2

Given the following relational schema (primary keys are underlined, optional attributes are denoted with '*'):

STUDENT (StudentID, Name, Surname, BirthDate)

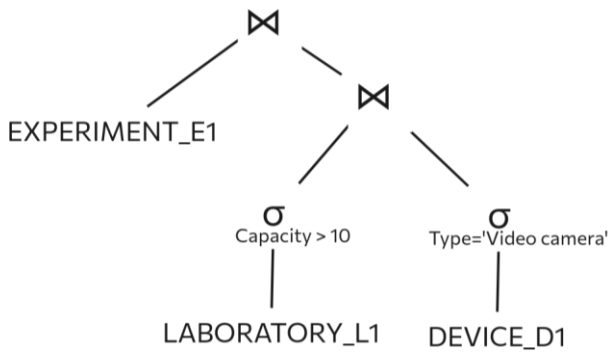
LABORATORY (LabID, LabName, Capacity)

DEVICE (DeviceID, DeviceName, Type, LabID)

EXPERIMENT (DeviceID, StudentID, Date, Description, Category)

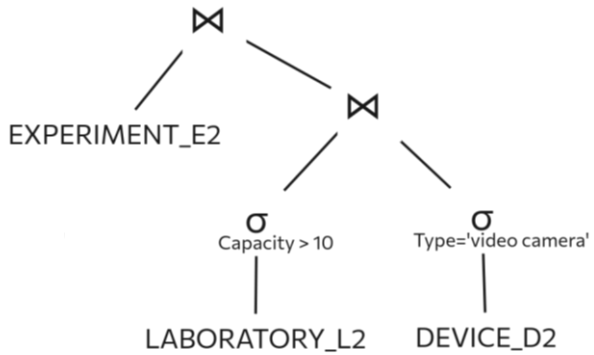
Show the name of laboratories with a capacity greater than 10 people, where at least 2 experiments were performed on the same day with devices of type ’video converter’.

Exercise 2



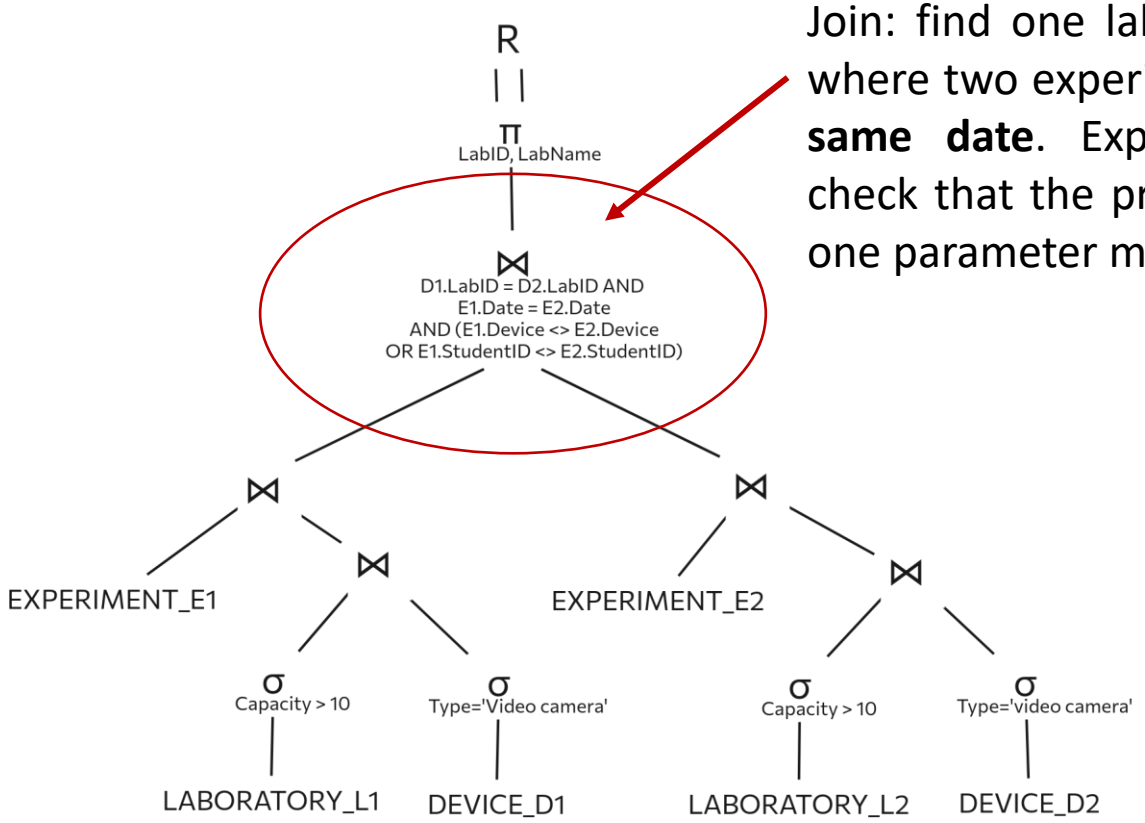
laboratories with a capacity greater than 10 people and with device of type ’video converter’ where at least one experiment was performed

Exercise 2



laboratories with a capacity greater than 10 people and with device of type ’video converter’ where at least one experiment was performed

Exercise 2

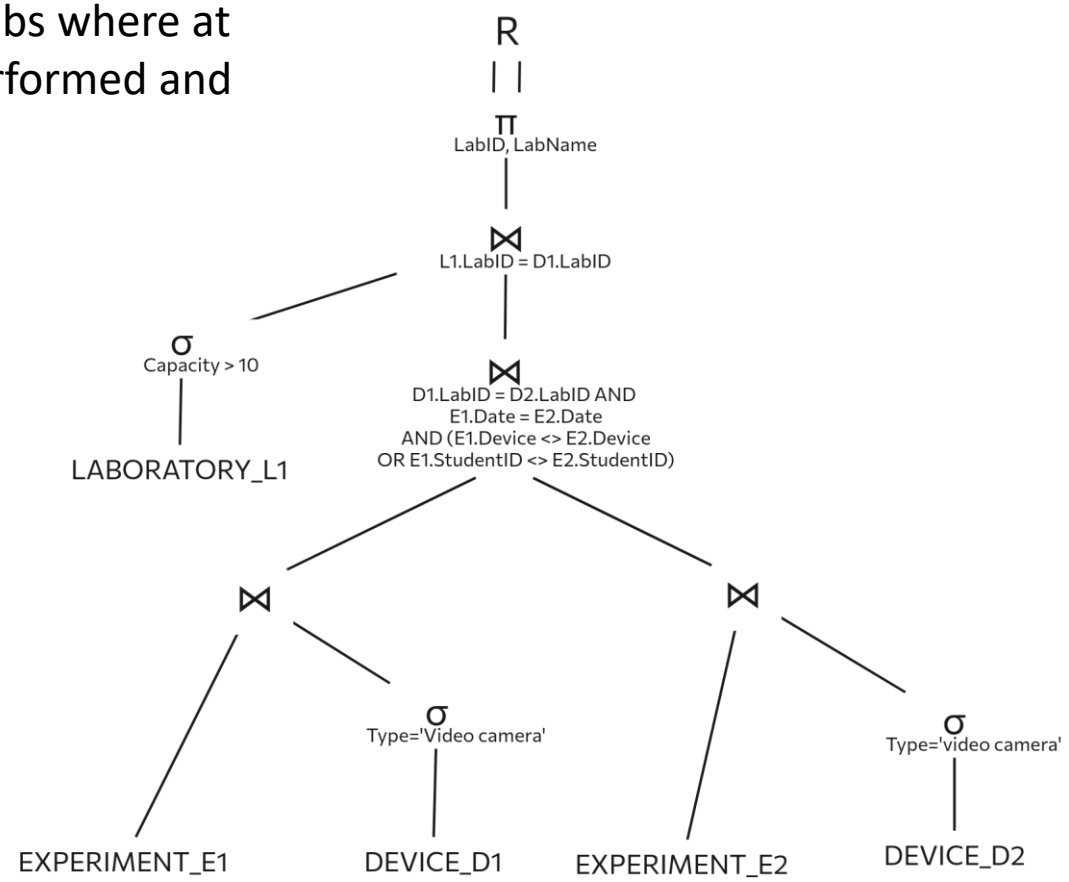


Join: find one laboratory (**same laboratory ID**) where two experiments were performed on the **same date**. Experiments must be different: check that the primary key is different (at least one parameter must be different)

EXPERIMENT (<u>DeviceID</u>, <u>StudentID</u>, Date, Description, Category)

Exercise 2

Alternative solution: first find labs where at least two experiments were performed and then filter for the size



Exercise 3

Given the following relational schema

TEENAGER (SSN, Name, Surname, BirthDate, CityOfResidence, Sex)

ACTIVITY (ActivityCode, AName, Description, Category)

SUMMER-CAMP (CampCode, CampName, City)

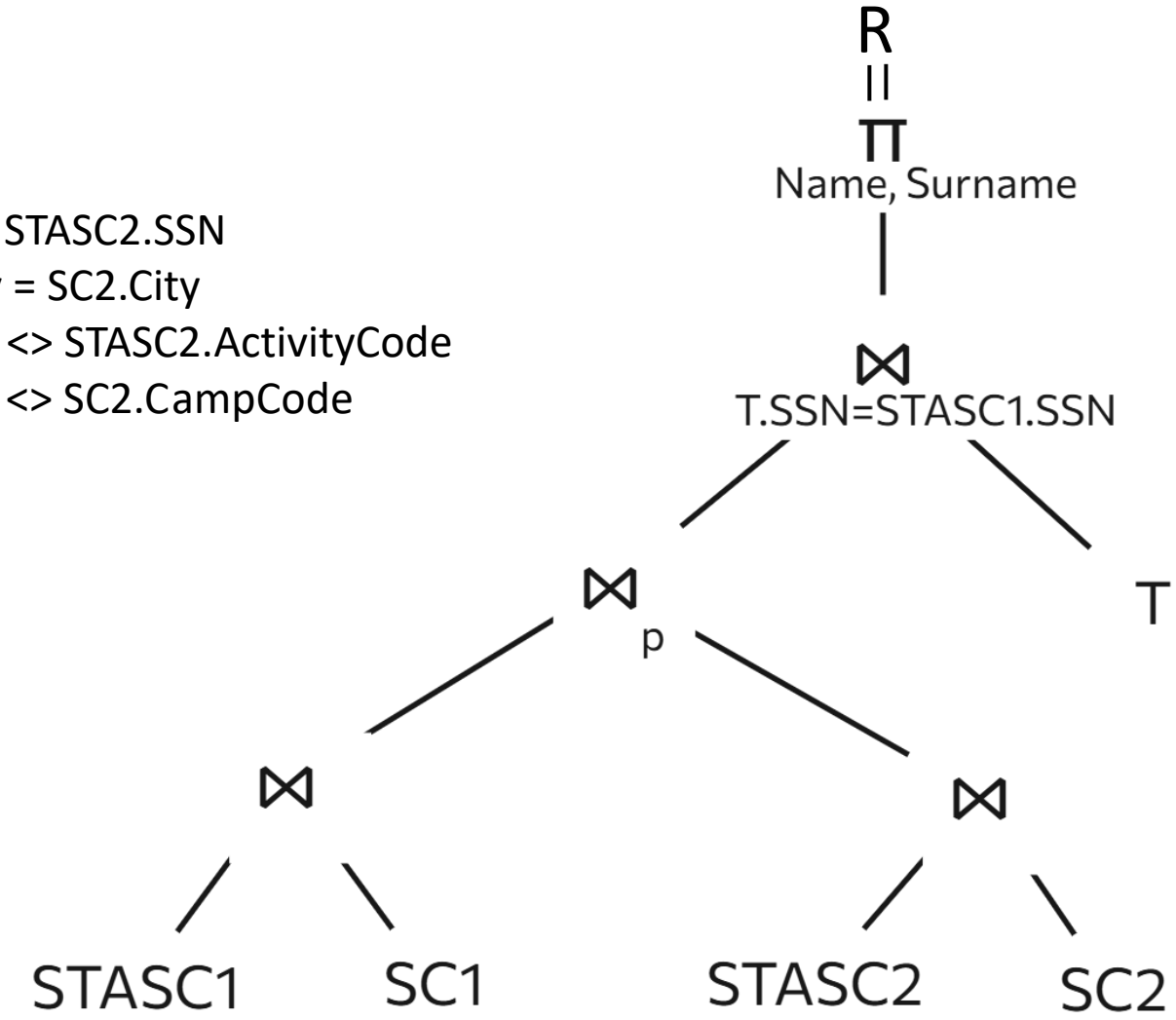
SUBSCRIPTION-TO-ACTIVITY-IN-SUMMER-CAMP (SSN, ActivityCode, CampCode, SubscriptionDate)

Write the following queries in relational algebra:

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.

Exercise 3

P:
STASC1.SSN = STASC2.SSN
AND SC1.City = SC2.City
AND STASC1.ActivityCode <> STASC2.ActivityCode
AND SC1.CampCode <> SC2.CampCode



Exercise 4

Given the following relational schema

DRUG (DrugCode, DrugName, Category)

PATIENT (PatientCode, PatientName, BirthDate)

DOCTOR (DoctorCode, DoctorName)

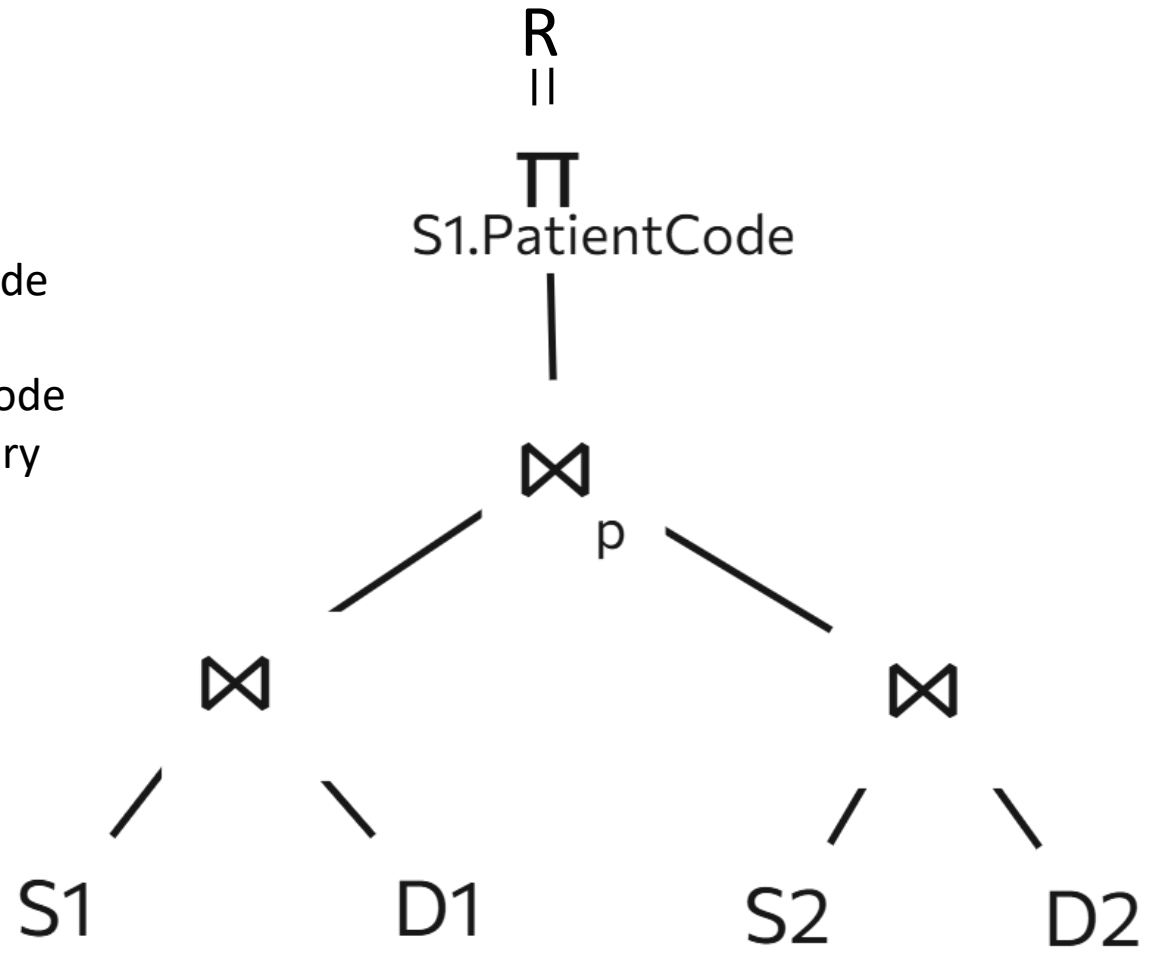
SALE (DrugCode, PatientCode, Date, DoctorCode, Quantity, Amount)

Write the following queries in relational algebra:

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

Exercise 4

P:
S1.PatientCode = S2.PatientCode
AND S1.Date = S2.Date
AND S1.DrugCode <> S2.DrugCode
AND D1.Category = D2.Category



Exercise 5

Given the following relational schema

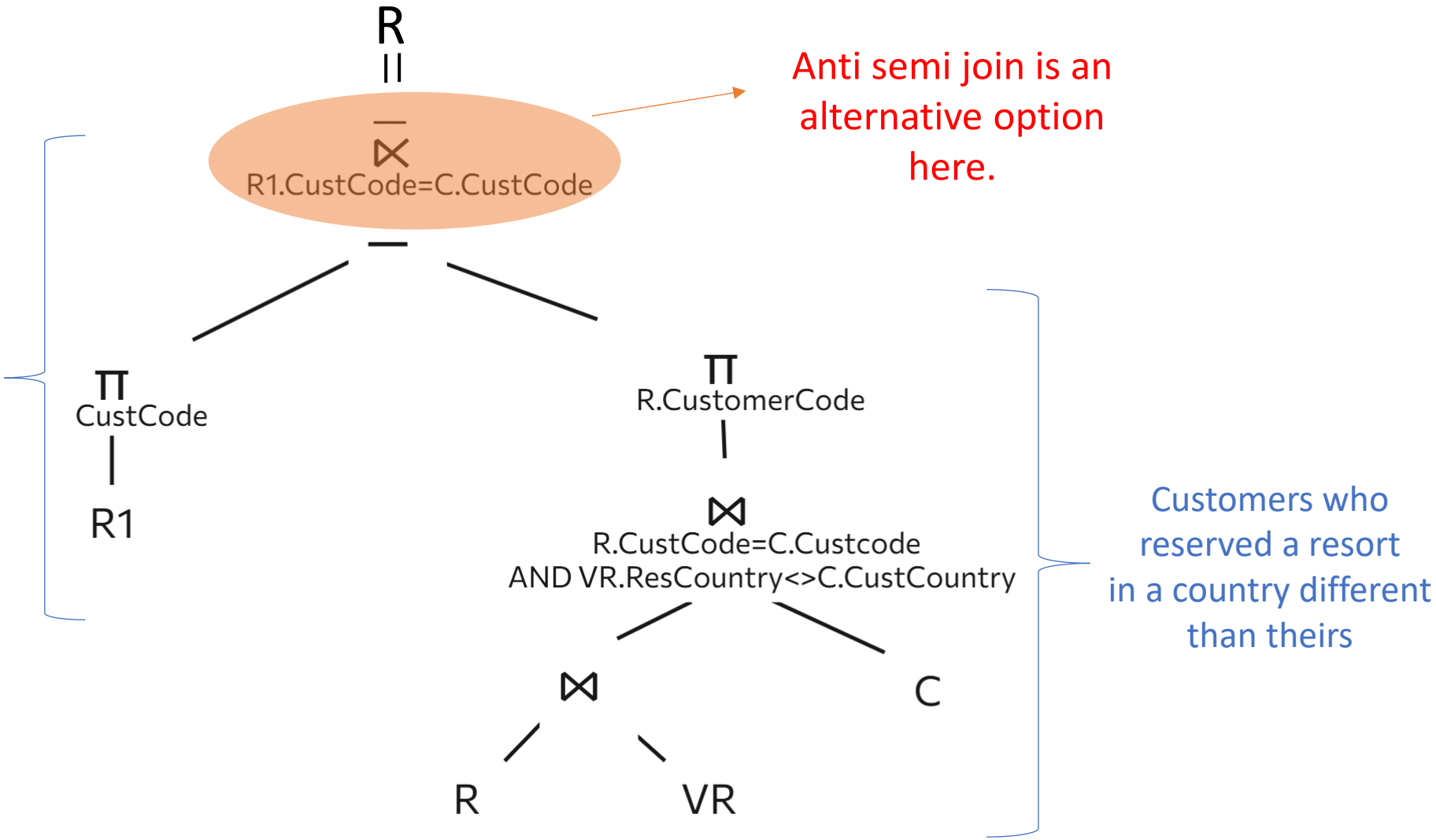
CUSTOMER (CustCode, CustName, Gender, AgeRange, CustCountry)
VACATION-RESORT (ResCode, ResName, ResType, Location, ResCountry)

RESERVATION (CustCode, StartDate, EndDate, ResCode)

Write the following queries in relational algebra:

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

Exercise 5


R
R1.CustCode=C.CustCode
Anti semi join is an alternative option here.
Customers who made at least one reservation
CustCode
R1
R.CustomerCode
R.CustCode=C.Custcode
AND VR.ResCountry<>C.CustCountry
C
R
VR
Customers who reserved a resort in a country different than theirs

Exercise 6

Given the following relational schema

PRODUCT (PCode, PName, Brand, Price)

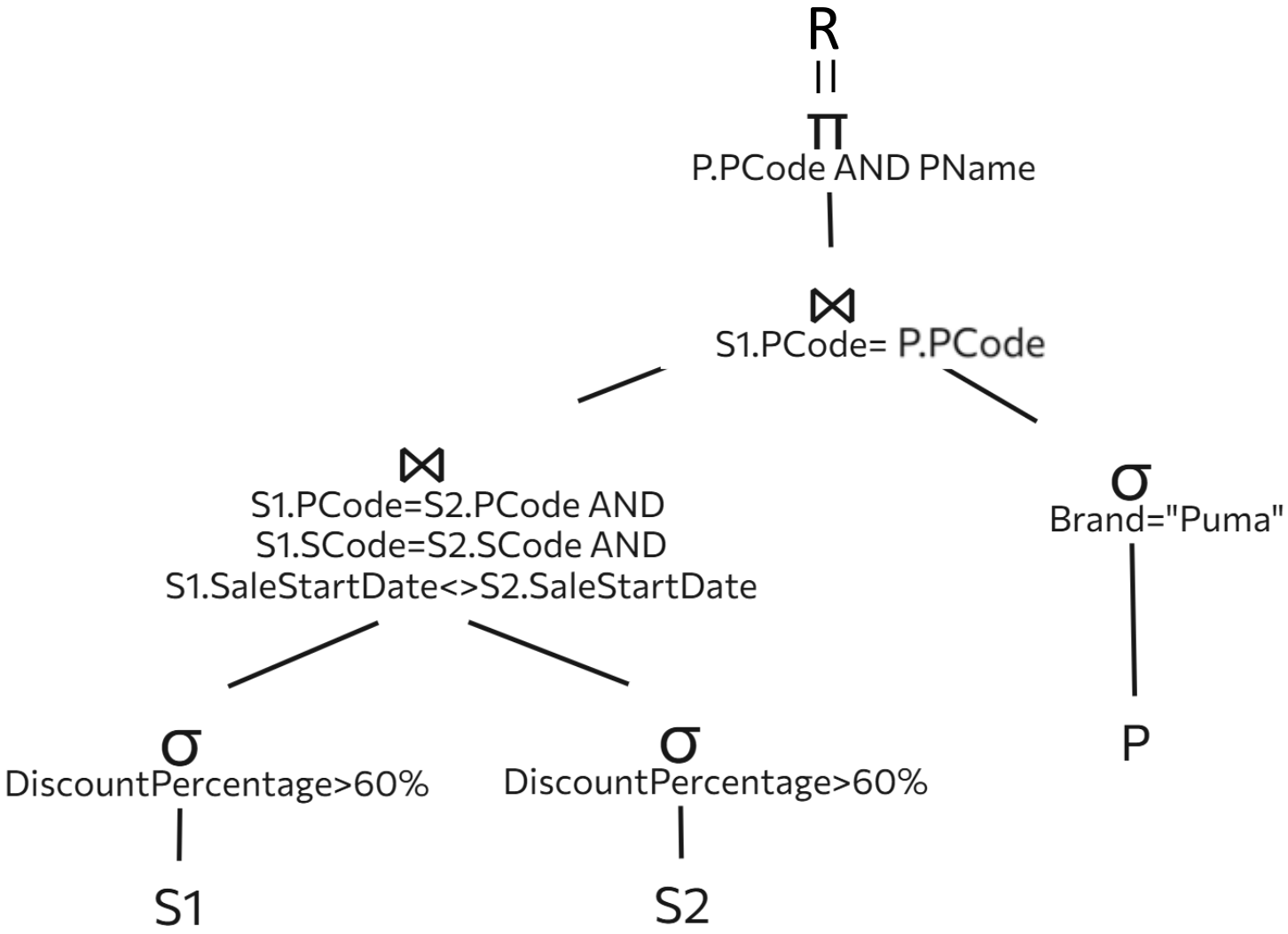
SHOP (SCode, SName, DateOpening, City)

SALE (PCode, SCode, SaleStartDate, Duration, DiscountPercentage)

Write the following queries in relational algebra:

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

Exercise 6


R
=
π
P.PCode AND PName
⋈
S1.PCode= P.PCode
⋈
S1.PCode=S2.PCode AND
S1.SCode=S2.SCode AND
S1.SaleStartDate<>S2.SaleStartDate
σ
Brand="Puma"
σ
DiscountPercentage>60%
σ
DiscountPercentage>60%
P
S1
S2