

Exercise 1

Let us consider the logical schema of a data mart

Customer(PkCustPhoneNo, CustName, CustCity)

CallingPlans(PkPlanId, PlanName)

Calls(PkCustPhoneNo, FkPlanId, Day, Month, Year, Duration, Charge)

where PkPlanId e PlanName are two different keys, and the following query

```
Q:  SELECT      Year, PlanName, SUM(Charge) AS TC
     FROM      Calls, CallingPlans
     WHERE     FkPlanId = PkPlanId AND Year >= 2000 AND Year <=2005
     GROUP BY Year, PlanName
     HAVING    SUM(Charge) > 1000;
```

- (a) **(3 points)** Show if and how the GROUP BY can be brought forward on the table Calls.

Exercise 2

Let us consider the logical schema of a data mart, without null values,

Customers(Phone, CustName, CustCity)

CallingPlans(PlanId, PlanName)

Calls(Phone, PlanId, Day, Month, Year, Duration, Charge)

and the following query

```
Q:  SELECT      CustCity, SUM(Charge) AS SC
     FROM      Calls NATURAL JOIN Customers
           AND Year = 2005 AND CustCity IN ('Roma', 'Milano')
     GROUP BY  CustCity;
```

1. Show if and how the GROUP BY can be brought forward on the table Calls.

Exercise 3

Let us consider the database without null values:

Customer(PKCustomer, CName, CCity)

Order(PKOrder, FKCustomer, ODate)

Product(PKProduct, PName, PCost)

OrderLine(LineNo, FKOrder, FKProduct, Quantity, ExtendedPrice, Discount, Revenue)

and the query

```
Q:  SELECT      CCity, AVG(Revenue) AS avgR
      FROM      OrderLine, Order, Customer
      WHERE     FKOrder = PKOrder AND FKCustomer = PKCustomer
      GROUP BY CCity, FKCustomer
      HAVING    SUM(Revenue) > 1000;
```

(a) (2 points) Show if and how the **GROUP BY** can be pushed on the join

(OrderLine $\bowtie_{FKOrder = PKOrder}$ Order).

(b) (2 points) Show if and how the **GROUP BY** can be pushed on the relation OrderLine.