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