TD1 : Manipulating a relational database

Let us consider a database used to track which stars practice which sports. The relational schema of the database is given as:
FACILITY(NUMF,NOMC,ADRC,COST)
ACTOR(NUMA,NAMEA,LNAMEA,ADRA)
MEMBER(NUMA,NUMF,DATEINSC)
OFFERS(NUMF,SPORT)
PRACTICE(NUMA,NUMF,SPORT)

In the following, we will consider the database occurrence given as:

FACILITY

NUMF	NOMC	ADRC	COST
101	Green Park	Evry	220
102	Maroushka	Cannes	260
103	Pleine Forme	Paris	230
104	Pleine Forme	Epinay	225
107	Nannou Center	Paris	260
108	Nannou Center	Nice	270

ACTOR

NUMA	NAMEA	LNAMEA	ADRA
001	Austine	OUFMAN	New-York
002	Omar	SHERIFF	Alexandria
003	Toyota	JAKSON	Paris
004	Hedi	MUFTI	Beverly Hills
007	Syn	KONNERY	London
008	Woody	HELENE	Paris

MEMBER

NUMA	NUMF	DATEINSC
001	101	17-Sep-92
001	102	22-Nov-92
002	101	5-Aug-93
002	103	23-Sep-93
002	107	24-Jan-94
004	107	5-Sep-91
007	104	4-Oct-91
007	107	13-Nov-91
007	108	4-Aug-92
008	107	10-Nov-93

OFFERS

NUMF	SPORT
101	FOOTBALL
101	KARTING
101	TENNIS
102	SWIMMING
103	FOOTBALL
103	HANDBALL
103	BASKETBALL
104	KARATE
104	YOGA
104	JUDO
107	GOLF
107	KARTING
107	TENNIS
107	RIDING
108	SWIMMING
108	DIVING

PRACTICE

NUMA	SPORT	NUMF
001	TENNIS	101
001	SWIMMING	102
002	FOOTBALL	101
002	FOOTBALL	103
002	KARTING	107
007	KARATE	104
007	YOGA	104
007	JUDO	104
007	KARTING	107
007	SWIMMING	108
007	DIVING	108
008	GOLF	107
008	TENNIS	107

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Based on an example from Faouzi Boufarès (Paris 13)

Relational Questions

1. Describe using relational algebra operators (selection, projection, join, … see question 2 for a possible syntax) the operations needed to obtain :
   a. Name and address of facilities whose cost is below 250 euros.
   b. Sports you can practice for less than 250 euros.
   c. Name and last name of actors that practice sports in facilities of Paris.
   d. Number of the facilities that do not offer football.
2. For each of these operations, indicate by a phrase what the request means, and give the result of the request over the database occurrence given on page 1.
   a. T1=Select(FACILITY, {ADRC = 'Paris'})
      T2=Join(OFFER,T1,{OFFER.NUMF=T1.NUMF})
      R=Project(T2,{SPORT})
   b. T1 = Join(ACTOR,MEMBER,{ACTOR.NUMA=MEMBER.NUMA})
      T2 = Join(FACILITY,T1,{FACILITY.NUMF=T1.NUMF})
      T3=Select(T2,{ADRA=ADRC})
      R=Project(T3,{NAMEA ,ADRA})
3. Consider the following alternate schema :

B1 :

   FACILITY(<u>NUMF</u>,NOMC,ADRC,COUT)
   ACTOR(<u>NUMA</u>,NAMEA,LNAMEA,ADRA)
   MEMBER(<u>NUMA,NUMF</u>,DATEINSC)
   OFFERS(<u>NUMF,SPORT</u>)
   PRACTICE(<u>NUMA,NUMF,SPORT</u>)

 B2:

   FACILITY(<u>NUMF</u>,NOMC,ADRC,COUT)
   ACTOR(<u>NUMA</u>,NAMEA,LNAMEA,ADRA)
   MEMBER(<u>NUMA,NUMF</u>,DATEINSC)
   OFFERS(<u>NUMF,SPORT</u>)
   PRACTICE(<u>NUMA,SPORT</u>)

Say for each schema whether one can answer the following requests. Where it is possible, outline the required operations and say whether the operations can be described only using relational operators:

	Request	B1	B2	Relational
1	What sports does actor A practice?			
2	What are the sports practiced by A in facility F?			
3	Which facilities have less then 10 members?			
4	Sort facilities by frequentation.			
5	For each facility, give the number of actors that practice tennis.			
6	Does there exist an actor that plays football in two different facilities?			
7	Give the number of the facilities that offer both football and tennis.			

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8	Show the list of actors, members of a facility F, that practice all sports offered by this facility.	
9	Show the list of actors that practice swimming in Paris.	
10	Show the list of actors that live in Paris and practice swimming.	

SQL Questions :

4. Write the following requests in SQL and compare to relational version (Question 1).
   a. Name and address of facilities whose cost is below 250 euros.
   b. Sports you can practice for less than 250 euros.
   c. Name and last name of actors that practice sports in facilities of Paris.
   d. Number of the facilities that do not offer football.
5. Write the following requests using SQL
   a. Name and last name of actors that do not practice any sport.
   b. Name and last name of actors that are members of a Parisian facility.
   c. Average cost of a facility (all facilities considered).
   d. Average cost for each facility name, in alphabetical order over facility name. (e.g. "Green Park" 220, "Nannou Center" 265) (Use GROUP BY clause!)
   e. Number of actors member of a "Nannou Centre".
6. Write three versions of the request :
   a. Name of actors that practice tennis or swimming.
   b. Number of centers that do not offer football.