Database Problem Set #1

1. Purchase needs all three attributes to distinguish it from every other purchase. If it were only CCN, the same card could buy from multiple merchants and you could not differentiate the purchases. If it were only CCN and MID, the same card could buy from the same merchant on different dates and you could not differentiate them.
2. SSN in Card is a foreign key to Cardholder, CCN in Purchase is a foreign key to Card, and MID in Purchase is a foreign key to Merchant
3. Select CName from Cardholder where City = Brooklyn
4. Select City from Merchant where MName = GoodBooks
5. Select h.name from Cardholder h, Card c, Merchant m, Purchase p  
   where m.City = Brooklyn and p.MID = m.MID and p.CCN = c.CCN and c.SSN = h.SSN
6. Select h.name from Cardholder h, Card c, Purchase p  
   where p.date in 2004 and p.CCN = c.CCN and c.SSN = h.SSN  
   MINUS

Select h.name from Cardholder h, Card c, Purchase p  
where p.date in 2005 and p.CCN = c.CCN and c.SSN = h.SSN

1. Select count(h.CName) from Cardholder h, Card c, Merchant m, Purchase p  
   where m.City = Brooklyn and p.MID = m.MID and p.CCN = c.CCN and c.SSN = h.SSN
2. Select h.CName from Cardholder h, Card c1, Card c2, Purchase p1, Purchase p2  
   where h.SSN = c1.SSN and h.SSN = c2.SSN and c1.CCN = p1.CCN and c2.CCN = p2.CCN
3. Select m.MName, count(distinct h.SSN)   
   from Cardholder h, Merchant m, Card c, Purchase p   
   where p.date in 2005 and p.CCN = c.CCN and h.SSN = c.SSN and p.MID = m.MID  
   group by m.MID
4. Select MName from

(Select m.MName, sum(p.amount) as s  
from Merchant m, Purchase p  
where m.MID=p.MID and p.date in 2005

Group by m.MName)

where s> 1,000,000

1. Select CName from Cardholders  
   MINUS  
   (Select CName, MName from Merchants, Cardholders  
   MINUS  
   Select h.CName, m.MID  
   from Cardholder h, Card c, Purchase p, Merchant m   
   where p.CCN = c.CCN and p.MID = m.MID and h.SSN = c.SSN)
2. Π CName(σ City=Brooklyn(Cardholder))
3. Π City(σ MName=Good Books(Merchant))
4. Π H.CName(σ H.SSN=C.SSN and C.CCN=P.CCN and P.MID=M.Mid and M.City=Brooklyn(ρH (Cardholder) x ρC (Card) x ρP (Purchase) x ρM (Merchant)))
5. Π H.CName(σ H.SSN=C1.SSN and H.SSN=C2.SSN and C1.CCN=P1.CCN and C2.CCN=P2.CCN(ρH (Cardholder) x ρC1 (Card) x ρC2 (Card) x ρP1 (Purchase) x ρP2 (Purchase)))
6. M.MNameg count(H.SSN) (σ p.date in 2005 and p.CCN = c.CCN and h.SSN = c.SSN and p.MID = m.MID(ρH (Cardholder) x ρC (Card) x ρP (Purchase) x ρM (Merchant)))
7. Π MName(σ s>1,000,000 (M.MNameg ρ s (sum(p.amount)) (σ p.date in 2005 and p.MID = m.MID(ρP (Purchase) x ρM (Merchant))))
8. Π H.CName (σ H.SSN=Z.SSN (ρz (Π H.SSN,M.MID(σ H.SSN=C.SSN and C.CCN=P.CCN and P.MID=M.MID(ρH (Cardholder) x ρC (Card) x ρP (Purchase) x ρM (Merchant))) ÷ Π M.MID(Merchant))) x ρH (Cardholder))
9. {t | ∃h ∈ Cardholder (t [CName ] = h [CName ] ∧ h [City ] = “Brooklyn” }
10. {t | ∃h ∈ Merchant (t [City ] = h [City ] ∧ h [MName ] = “Good Books” }
11. {t | ∃h ∈ Cardholder (t [CName ] = h [CName ] ∧ ∃c ∈ Card (h [SSN ] = c[SSN] ∧ ∃p ∈ Purchase (c [CCN ] = p[CCN] ∧ ∃m ∈ Merchant (p [MID ] = m[MID] ∧ m[City] = “Brooklyn”)))}
12. {t | ∃h ∈ Cardholder (t [CName ] = h [CName ] ∧ ∃c ∈ Card (h [SSN ] = c[SSN] ∧ ∃p1 ∈ Purchase (c [CCN ] = p1[CCN] ∧ p1[date] in 2005 ∧ ¬ ∃p2 ∈ Purchase (c [CCN ] = p2[CCN] ∧ p2[date] in 2005 }
13. {t | ∃h ∈ Cardholder (t [CName ] = h [CName ] ∧ ∃c1 ∈ Card (h [SSN ] = c1[SSN] ∧ ∃c2 ∈ Card (h [SSN ] = c2[SSN] ∧ ∃p1 ∈ Purchase (c1 [CCN ] = p1[CCN] ∧ ∃p2 ∈ Purchase (c2 [CCN ] = p2[CCN] }
14. Cannot represent with relational calculus as it uses an aggregate function

Bicycle Delivery System

Company(Cid, CName, Location, Phone Number)

Account(Username, Password, Cid, Department, Credit Balance)

Delivery(Did, Item, Sender\_Cid, Receiver\_Cid, Sender\_Name, Receiver\_Name, Date/Time\_Ordered, Date/Time\_Sent, Date/Time\_Received, Messenger\_Name, Account\_Charged, Cost)

Username must be unique, Department field is optional

Foreign keys: Cid in Account is a FK to Cid in Company, Sender\_Cid and Receiver\_Cid in Delivery are FKs to Cid in Company, Account\_Charged in Delivery is a FK to Username in Account

i)Select C.CName

from Company Z, Company C, Delivery D

where Z.CName = Z-Corp and Z.Cid = D.Receiver\_Cid and C.Cid = Sender\_Cid and Date/Time\_Received in 2004

ii) Select Messenger\_Name, Count(Did)

from Delivery

group by Messenger\_Name

iii) Select C.CName, Sum(D.Cost)

from Delivery D, Company C

where C.Cid = D.Sender\_Cid

group by D.Sender\_Cid