CSCI 2141
Winter 2013
Assignment 2
Due: 9:35 am, February 6, 2013

Groups of up to 3 students permitted

Consider the following database schema (old timey – from when we didn't download from itunes!) :

    Album (AlbumID, releaseDate, listPrice, publisher, title, copyright)
    Artist (firstName, lastName, address)
    AlbumArtist (AlbumID, firstName, lastName)
    MusicStore (name, address)
    Stock (storeName, AlbumID, storePrice, quantity)

The Artist relation gives the author's first and last names and address. Each first name/last name pair is unique. The Album relation gives the albumID, title, copyright date, release date, and recommended list price. Since an album can have multiple recording artists, the relation AlbumArtist matches up artists (identified by name) with albums (identified by AlbumID). The Musicstore relation gives the name (key) and address of a music store. The Stock relation gives the music store name, the price, and the AlbumID number of the album. ListPrice and storePrice are real numbers. Copyright and releaseDate are integers (representing the year). All other attributes are strings.

Questions: (Write the answer in relational algebra)

1. Return all albums (albumID only) with a list price over $50.
2. Return all albums (albumID only) with a release date before Jan. 11, 2010 or whose publisher is 'SolidGold'.
3. Return all addresses (both for artists and music stores).
4. Return all artists that have not released an album.
5. Return the list of albums on which Cat Stevens is an artist.
6. Return the list of albums written by Cat Stevens that cost less than $40.
7. Find all artists (firstName, lastName) who have released albums after Feb. 1, 2000.
8. Find all artists who have released more than one album.
9. Find pairs of albums with different album IDs but the same title. A pair should be listed only once; e.g., list (i,j) but not (j,i).

10. List all the albums (Album ID only) that 'Sam The Record Man' sells that 'HMV' also sells.
11. List all the albums (Album ID only) that 'Sam The Record Man' sells that 'HMV' sells for less.
12. Find all the albums published by Solid Gold that are in-stock at Sam The Record Man.

Answers:

1. $\pi_{albumID}(\sigma_{listPrice > 50}(Album))$
2. $\pi_{albumID}(\sigma_{releaseDate < \text{'01-11-2010' OR publisher = 'Solid Gold'}}(Album))$
3. $\pi_{address}(Artist) \cup \pi_{address}(Musicstore)$
4. $\pi_{firstName, lastName}(Artist) - \pi_{firstName, lastName}(AlbumArtist)$
5. $\pi_{albumID}(\sigma_{firstName = \text{'Cat' and lastName = 'Stevens'}}(AlbumArtist))$
6. $\pi_{albumID}(\sigma_{firstName = \text{'Cat' and lastName = 'Stevens' and listPrice < 40}}(AlbumArtist \times Album))$
7. $\pi_{firstName, lastName}(\sigma_{releaseDate > \text{'02-01-2000'}}(AlbumArtist * Album))$
8. $\pi_{A1.firstName, A1.lastName}(\sigma_{A1.firstName = A2.firstName \text{ AND } A1.lastName = A2.lastName \text{ AND } A1.albumID \text{ != } A2.albumID}(AlbumArtist\ A1 \times AlbumArtist\ A2))$
   With a join:
   $\pi_{A1.firstName, A1.lastName}(AlbumArtist\ A1 \bowtie_{A1.firstName = A2.firstName \text{ AND } A1.lastName = A2.lastName \text{ AND } A1.albumID \text{ != } A2.albumID} AlbumArtist\ A2)$
9. $\pi_{A1.albumID, A2.albumID}(\sigma_{A1.title = A2.title \text{ AND } A1.albumID \text{ != } A2.albumID \text{ AND } A1.albumID < A2.albumID}(Album\ A1 \times Album\ A2))$
   With a join:
   $\pi_{A1.albumID, A2.albumID}(Album\ A1 \bowtie_{A1.title = A2.title \text{ AND } A1.albumID \text{ != } A2.albumID \text{ AND } A1.albumID < A2.albumID} Album\ A2)$
10. $\pi_{albumID}(\sigma_{storeName = \text{'Sam The Record Man'}}(Stock)) \cap \pi_{albumID}(\sigma_{storeName = \text{'HMV'}}(Stock))$
    OR
    $\pi_{S1.albumID}(\sigma_{S1.storeName = \text{'Sam The Record Man' AND S2.storeName = 'HMV' and } S1.albumID=S2.albumID}(Stock\ S1 \times Stock\ S2))$
    OR
    $\pi_{S1.albumID}(\sigma_{S1.storeName = \text{'Sam The Record Man'}}(Stock\ S1) \bowtie_{S1.albumID=S2.albumID} \sigma_{S2.storeName = \text{'HMV'}}(Stock\ S2))$
11. $\pi_{S1.albumID}(\sigma_{S1.albumID = S2.albumID \text{ AND } S2.storePrice < S1.storePrice \text{ AND } S1.storeName = \text{'Sam The Record Man' AND } S2.storeName = \text{'HMV'}}(Stock\ S1 \times Stock\ S2))$
    OR
12. $\pi_{S1.albumID}(\sigma_{S1.storeName = \text{'Sam The Record Man'}}(Stock\ S1) \bowtie_{S1.albumID = S2.albumID \text{ AND } S2.storePrice < S1.storePrice} (\sigma_{S2.storeName = \text{'HMV'}}(Stock\ S2))$

13. $\pi_{albumID}(\sigma_{storeName='Sam\ The\ Record\ Man'\ AND\ quantity\ >\ 0}(Stock * \sigma_{publisher='Solid\ Gold'}(Album)))$