Solution HW 6, 514 6.19, 10 pts 6.18, 10 pts SQL for 6.18 only, 10 pts

Symbols - Students who did not use the formal symbols $\sigma, \pi, \exists, \bowtie$ received a 1 point downgrade. You must be able to communicate using formal concepts and notation. All symbols except JOIN were available in MS Symbols or open source symbols.

Let Book be aliased as B, BOOK_AUTHORS as BA, BOOK_COPIES as BC, BOOK_LOANS as BL, LIBRARY_BRANCH as LB

6.18 a)

$$Q \leftarrow \pi_{\text{LB.Branch\_Name, B.Title, BC.No\_of\_Copies}} \left( \sigma_{\text{B.Title = "The Lost Tribe" AND LB.Branch\_Name = "Sharpstown"}} \left( B \bowtie_{\text{B.Book\_ID = BC.BookID}} BC \bowtie_{\text{BC.Branch\_ID = LB.Branch\_ID}} LB \right) \right)$$

Q

| LB.Branch_Name | B.Title | BC.No of Copies |
|---|---|---|
| Sharpstown | The Lost Tribe | 6 |

only 1 row results, for Sharpstown

6.18 b) For this query, all I have to do is remove the boolean selection of Sharpstown and each Library ID and name is returned

$$Q \leftarrow \pi_{\text{LB.Branch\_Name, B.Title, BC.No of Copies}} \left( \sigma_{\text{B.Title = "The Lost Tribe"}} \left( B \bowtie_{\text{B.BookID = BC.BookID}} BC \bowtie_{\text{BC.Branch\_ID = LB.Branch.ID}} LB \right) \right)$$

Q

| LB.Branch_Name | B.Title | BC.No of Copies |
|---|---|---|
| A Library | The lost Tribe | 4 |
| B Library | The Lost Tribe | 5 |
| C Library | The Lost Tribe | 1 |
| ⋮ | | |
| Sharpstown | The Lost Tribe | 6 |
| ⋮ | | |

6.18 c) This DB developer forgot ~~to~~ to put a return date on his BOOK_LOANS table.
So I will assume that BOOK_LOANS only holds records for books that are out on loan now.
If that is true, I can use LEFT OUTER JOIN to keep all the Borrowers and match them to BOOK_LOANS, padding Null where the BORROWER has no BOOK_LOAN.
From that set, I can choose all the rows where Null was placed in the BL.Date_Out or BL.DueDate attributes.
All I need to do is project the Names from those rows.

$$Q \leftarrow \Pi_{BR.Name}\left(\sigma_{\substack{BR.Date\_Out = Null \\ AND \\ BR.Due\_Date = Null}}\left(BR \bowtie_{\substack{BR.Card\_no = \\ BL.Card\_no}} BL\right)\right)$$

Q

| BR.Name |
| --- |
| Lopez |
| Wong |
| Michael |
| ⋮ |

6.18 d)

$$Q \leftarrow \pi_{\substack{BR.Name,\\ BR.Address,\\ B.Title}} \left( \sigma_{BL.DueDate = Today()} \left( BR \bowtie_{BR.Card\_no = BL.Card\_no} BL \bowtie_{BL.Book\_ID = B.Book\_ID} B \right) \right)$$

Q

| BR.Name | BR.Address | B.Title |
|---|---|---|
| Arpit | 123 ABC Road | 20,000 Leagues |
| Debra | 456 Database Lane | Catcher In The Rye |
| ⋮ | ⋮ | ⋮ |

6.18 e) You had to aggregate on this one!

$$Q_{\substack{LB.Branch\_Name,\\ No.of.Books\_Loaned}} \leftarrow {}_{LB.Branch\_Name}\mathcal{F}_{Count(BL.Book\_ID)} \left( LB \bowtie_{LB.Branch\_ID = BL.Branch\_ID} BL \right)$$

Q

| LB.BranchName | No. of Books Loaned |
|---|---|
| A Library | 42 |
| B Library | 97 |
| ⋮ | ⋮ |
| Shaipstown | 156 |
| ⋮ | ⋮ |

6.18 f) I'm nesting an aggregation and a selection - exciting!

MORETHAN5 $\leftarrow \sigma_{\text{No\_of\_Books\_Out} > 5}\left(\text{BR.Name}\ \mathcal{F}_{\text{count(BL.Book\_id}}\ (\text{BR} \bowtie_{\text{BR.Card\_no} = \text{BL.Card\_no}} \text{BL})\right)$

BR.Name,
BR.Address
No_of_Books_Out

MORE_THAN_5

| BR.Name | BR.Address | No_of_Book_Out |
|---|---|---|
| Debi | 456 Database Ln | 12 |
| Michael | 789 School Road | 7 |

6.18 g)

CENTRAL KING BOOKS $\leftarrow \Pi_{\text{B.Title, BC.No\_of\_Copies, LB.BranchName}}\left(\sigma_{\text{LB.BranchName} = \text{"Central"}\ \text{AND}\ \text{BA.AuthorName} = \text{"Stephen King"}}\left(\text{B} \bowtie_{\text{B.Book\_id} = \text{BA.Book\_id}} \text{BA} \bowtie_{\text{BA.Book\_id} = \text{BC.Book\_id}} \text{BC} \bowtie_{\text{BC.Branch\_id} = \text{LB.Branch\_id}} \text{LB}\right)\right)$

CENTRAL_KING_BOOKS

| B.Title | BC.No_of_Copies | LB.BranchName |
|---|---|---|
| Gone with the Wind | 2 | Central |
| Summer Vacation | 6 | Central |
| Lost in Space | 4 | Central |
| ⋮ | ⋮ | ⋮ |

6.19 a) Let CUSTOMER have the alias C
ORDER have the alias O
ORDER_ITEM have the alias OI
ITEM have the alias I
SHIPMENT have the alias S
WAREHOUSE have the alias W

$$Q \leftarrow \pi_{\substack{O.Order\#,\\ S.Ship\_Date}} \left( \sigma_{W.Warehouse\# = 2} \left( W \bowtie_{\substack{W.Warehouse\# = \\ S.Warehouse\#}} S \bowtie_{\substack{S.Order\# = \\ O.Order\#}} O \right) \right)$$

Q

| O.Order# | S.Ship_Date |
|---|---|
| 101 | 2004-01-01 |
| 105 | 2005-01-01 |
| 152 | 2004-02-01 |
| 171 | 2004-03-01 |
| ⋮ | ⋮ |

6.19 b)

$$Q \leftarrow \pi_{\substack{O.Order\#,\\ S.Warehouse\#}} \left( \sigma_{\substack{C.Cname = \\ \text{"Jose Lopez"}}} \left( C \bowtie_{\substack{C.Cust\# = \\ O.Cust\#}} O \bowtie_{\substack{O.Order\# = \\ S.Order\#}} S \right) \right)$$

Q

| O.Order# | S.Warehouse# |
|---|---|
| 105 | 2 |
| 106 | 3 |
| 421 | 5 |
| 501 | 1 |

6.19 c) Two aggregations at once.

$$Q \leftarrow C.Cname\ \mathcal{F}_{count(O.Order\#),\ average(O.Ord\_amt)}\left(C \bowtie_{C.Cust\# = O.Cust\#} O\right)$$

Q: C.cname, No_of_Orders, Avg_Order_Amt

| C.CName | No_of_Orders | Avg_Order_Amt |
|---|---|---|
| Debi | 3 | 52.27 |
| Andrew | 2 | 25.50 |
| Scott | 5 | 101.10 |
| ⋮ | ⋮ | ⋮ |

6.19 d)

$$Q \leftarrow \Pi_{O.order\#}\left(\sigma_{S.ShipDate - O.Odate > 30}\left(O \bowtie_{O.Order\# = S.Order\#} S\right)\right)$$

Q

| O.Order# |
|---|
| 101 |
| 205 |
| 695 |
| 421 |
| ⋮ |

6.19 e)

$$Q \leftarrow \Pi_{S.Order\#}\left(\sigma_{W.City = \text{"New York"}}\left(S \bowtie_{\substack{S.Warehouse\# = \\ W.Warehouse\#}} W\right)\right)$$

Q

| S. Order # |
|---|
| 150 |
| 160 |
| 201 |
| 301 |
| . |
| . |
| . |

SQL

6.18 a)

```
SELECT AB.BranchName, B.Title, BC.No-of-Copies
FROM BOOK B, BOOK_COPIES BC, LIBRARY_BRANCH LB
WHERE B.Book_id = BC.Book_id
      AND
      BC.Branch_id = LB.Branch_id
      AND
      B.Title = "The Lost Tribe"
      AND
      LB.Branch_Name = "Sharpstown";
```

6.18 b)

```
SELECT LB.Branch_Name, B.Title, BC.No_of_Copies
FROM BOOK B, BOOK_COPIES BC, LIBRAYBRANCH LB
WHERE B.Book_id = BC.Book_id
      AND
      BC.Branch_id = LB.Branch_id
      AND
      B.Title = "The Lost Tribe";
```

6.18 c)

```
SELECT BR.Name
FROM BORROWER BR LEFT OUTER JOIN BOOK_LOANS BL
     ON BR.Card-no = BL.Card_no
WHERE BR.Date-Out = NULL
      AND
      BR.Due_date = Null;
```

6.18 d)

```
SELECT BR.Name, BR.Address, B.Title
FROM BORROWER BR, BOOK_LOAN BL, BOOK B
WHERE BR.Cardno = BL.Card_no
      AND
      BL.Book_id = B.Book_id
      And
      BR.Due_date = Today();
```

6.18 e)

```
SELECT LB.Branch_Name, Count(BL.Book_id) No_of_Books_Loaned
FROM LIBRARY_BRANCH LB, BOOK_LOAN BL
WHERE LB.Branch_id = BL.Branch_id;
```

6.18 f)

```
SELECT *
FROM ( SELECT BR.Name, BR.Address, Count(BL.Book_id)
       No_of_Books_Out
       FROM BORROWER BR, BOOK_LOAN BL
       WHERE BR.Card_no = BL.Card_no)
WHERE No_of_Books_Out > 5;
```

6.18 g)

```
SELECT B.Title, BC.No_of_Copies, LB.Branch_Name
FROM BOOK B, BOOK_AUTHORS BA, BOOK_COPIES BC,
     LIBRARY_BRANCH LB
WHERE B.Book_id = BA.Book_id
      AND
      BA.Book_id = BC.Book_id
      AND
      BC.Branch_id = LB.Branch_id
      AND
      LB.Branch_Name = "Central"
      AND
      BA.Author_Name = "Stephen King";
```