Ryan Lockman
HW6
Database Systems

KEYS: sigma = O~ aggregate = ℑ join = |><| project = π

6.18

a.

SHARP ← O~ Branch_Name='Sharpstown' (LIBRARY_BRANCH)
TRIBE ← O~ Title='The Lost Tribe' (BOOK)
RESULT ← O~ Branch_id=SHARP.Branch_id AND Book_id = TRIBE.Book_id (BOOK_COPY)

Book_id	Branch_id	No_of_copies
45362	062	21

```
SELECT * AS SHARP
FROM LIBRARY_BRANCH
WHERE Branch_Name = 'Sharpstown';

SELECT * AS TRIBE
FROM BOOK
WHERE Title = 'The Lost Tribe';

SELECT * AS RESULT
FROM BOOK_COPY
WHERE Branch_id = SHARP.Branch_id
        AND
        Book_id = TRIBE.Book_id;
```

b.

TRIBE ← O~ Title='The Lost Tribe' (BOOK)
RESULT ← TRIBE |><| TRIBE.Book_id = BOOK_COPY.Book_id BOOK_COPY

Book_id	Title	Publisher_name	Branch_id	No_of_copies
45362	The Lost Tribe	Roy Henz	062	21
45362	The Lost Tribe	Roy Henz	071	10

```
SELECT * AS TRIBE
FROM BOOK
WHERE Title = 'The Lost Tribe';

SELECT * AS RESULT
FROM TRIBE
INNER JOIN BOOK_COPY
ON TRIBE.Book_id = BOOK_COPY.Book_id;
```

c.

RESULT ← BARROWER |><| BARROWER.Card_no = BOOK_LOANS.Card_no BOOK_LOANS
π Card_no, Name (RESULT)

or you could use:

RESULT ← BARROWER – BOOK_LOANS

Card_no	Name
212	Bob Myer
161	Ryan Lockman

```
SELECT * AS RESULT
FROM BARROWERS
INNER JOIN BOOK_LOANS
ON BARROWER.Card_no ≠ BOOK_LOANS.Card_no;

SELECT DISTINCT RESULT.Card_no, RESULT.Name
FROM RESULT;
```

d.

SHARP ← O~ Branch_Name='Sharpstown' (LIBRARY_BRANCH)
S_BOOKS_OUT ← O~ Branch_id = SHARP.Branch_id AND Due_date='2014-04-07' (BOOK_LOANS)

Bar_S_BOOKS_OUT ← S_BOOKS_OUT |><| S_BOOKS_OUT.Card_no = BARROWER.Card_no BARROWER
RESULT ← Bar_S_BOOKS_OUT |><| Bar_S_BOOKS_OUT.Book_id = BOOK.Book_id BOOK
π Name, Address, Title (RESULT)

Title	Name	Address
The Wolf	Ryan Lockman	462 South St
My Way	Ben Stills	212 N Mine St

```
SELECT * AS SHARP
FROM LIBRARY_BRANCH
WHERE Branch_Name = 'Sharpstown';

SELECT * AS S_BOOKS_OUT
FROM BOOK_LOANS
WHERE Branch_id = SHARP.Branch_id
        AND
        Due_date = '2014-04-07';

SELECT * AS Bar_S_BOOKS_OUT
FROM S_BOOKS_OUT
INNER JOIN BARROWER
ON S_BOOKS_OUT.Card_no = BARROWER.Card_no;

SELECT * AS RESULT
FROM BAR_S_BOOKS_OUT
INNER JOIN BOOK
ON BAR_S_BOOKS_OUT.Book_id = BOOK.Book_id;
```

```
SELECT DISTINCT RESULT.Name, RESULT.Address, RESULT.Title
FROM RESULT;
```

e.

LIB_OUTS ← LIBRARY_BRANCH |><|$_{\text{LIBRARY\_BRANCH.Branch\_no = BOOK\_LOANS.Branch\_no}}$ BOOK_LOANS

LIB_OUTS_COPIES ← LIB_OUTS |><|$_{\text{LIB\_OUTS.Branch\_no = BOOK\_COPIES.Branch\_no}}$ BOOK_COPIES

$_{\text{Branch\_name}}\Im_{\text{SUM No\_of\_copies}}$(LIB_OUTS_COPIES)

$\pi_{\text{Branch\_name,SUM\_No\_of\_copies}}$(LIB_OUTS_COPIES)

No we need to count(Book_id)? – 1

Branch_name	SUM_No_of_copies
Central	1265
Sharpstown	2364

```
SELECT * AS LIB_OUTS
FROM LIBRARY_BRANCH
INNER JOIN BOOK_LOANS
ON LIBRARY_BRANCH.Branch_no = BOOK_LOANS.Branch_no;

SELECT * AS LIB_OUTS_COPIES
FROM LIB_OUTS
INNER JOIN BOOK_COPIES
ON LIB_OUTS.Branch_no = BOOK_COPIES.Branch_no;

SELECT SUM(No_of_copies)
FROM LIB_OUTS_COPIES
GROUP BY Branch_name;

SELECT DISTINCT LIB_OUTS_COPIES.Branch_name,
                LIB_OUTS_COPIES.SUM_No_of_copies
FROM LIB_OUTS_COPIES;
```

f.

BAR_BOOK_OUT ← BARROWER|><|$_{\text{BARROWER.Card\_no = BOOK\_LOANS.Card\_no}}$ BOOK_LOANS

$_{\text{Card\_no}}\Im_{\text{COUNT Book\_id}}$(BAR_BOOK_OUT)

BAR_MORE_5 ← $O\sim_{\text{COUNT\_Book\_id} > 5}$(BAR_BOOK_OUT)

$\pi_{\text{Name,Address,COUNT\_Book\_id}}$(BAR_MORE_5)

Name output – 1

Name	Address	COUNT_Book_id
Ben Small	121 S High	6
Ryan Sans	216 N Moore	9

```
SELECT * AS BAR_BOOK_OUT
FROM BARROWER
INNER JOIN BOOK_LOANS
ON BARROWER.Card_no = BOOK_LOANS.Card_no;

SELECT COUNT(Book_id)
FROM BAR_BOOK_OUT
GROUP BY Card_no;
```

```
SELECT * AS BAR_MORE_5
FROM BAR_BOOK_OUT
WHERE COUNT_Book_id > 5;

SELECT DISTINCT BAR_MORE_5.Name, BAR_MORE_5.Address,
                BAR_MORE_5.COUNT_Book_id
FROM BAR_MORE_5;
```

g.

KING ← $O_{Author\_Name='Stephan\ King'}$ (BOOK_AUTHORS)
KING_BOOKS ← KING $|><|_{KING.Book\_id=BOOK.Book\_id}$ BOOK

CENT ← $O_{Branch\_Name='Central'}$ (LIBRARY_BRANCH)
CENT_BOOKS ← CENT $|><|_{CENT.Branch\_no=BOOK\_COPIES.Branch\_no}$ BOOK_COPIES

CENT_KING ← CENT_BOOKS $|><|_{CENT\_BOOKS.Book\_no=KING\_BOOKS.Book\_no}$ KING_BOOKS
π_{Title,No_of_copies} (CENT_KING)

Title	No_of_copies
The Lost Ship	6
Stolen Art	12

```
SELECT * AS KING
FROM BOOK_AUTHORS
WHERE Author_Name = 'Stephan King';

SELECT * AS KING_BOOKS
FROM KING
INNER JOIN BOOK
ON KING.Book_id = BOOK.Book_id;

SELECT * AS CENT
FROM LIBRARY_BRANCH
WHERE Branch_Name = 'Central';

SELECT * AS CENT_BOOKS
FROM CENT
INNER JOIN BOOK_COPIES
ON CENT.Branch_no = BOOK_COPIES.Branch_no;

SELECT * AS CENT_KING
FROM CENT_BOOKS
INNER JOIN KING_BOOKS
ON CENT_BOOKS.Book_no = KING_BOOKS.Book_no;

SELECT DISTINCT CENT_KING.Title, CENT_KING.No_of_copies
FROM CENT_KING;
```

6.19

a.

War_2 ← $O_{Warehouse\#=2}$ (SHIPMENT)
$\pi_{Order\_Ship\_date}$ (War_2)

Order#	Ship_date
4213	2014-01-01
6215	2013-12-13

b.

$J\_LOPEZ \leftarrow O_{Cname = 'Jose\ Lopez'}(CUSTOMER)$

$JL\_ORDERS \leftarrow ORDER \mid><\mid_{ORDER.Cust\# = J\_LOPEZ.Cust\#} J\_LOPEZ$

$JL\_SHIPMENTS \leftarrow JL\_ORDERS \mid><\mid_{JL\_ORDERS.Order\# = SHIPMENT.Order\#} SHIPMENT$

$\pi_{Order\#, Warehouse\#}(JL\_SHIPMENTS)$

Order#	Warehouse#
6251	02
1242	04

c.

$CUST\_ORDERS \leftarrow CUSTOMER \mid><\mid_{CUSTOMER.Cust\# = ORDER.Cust\#} ORDER$

$\rho_{R(Cname,\ No\_of\_orders,\ Avg\_order\_amount)}(_{Cname}\Im_{COUNT\ Order\#,\ AVERAGE\ Ord\_amt}(CUST\_ORDERS))$

Cname	No_of_orders	Avg_order_amount
Ben Still	6	$21.23
Ryan Moore	4	$16.98

d.

$SHIP\_ORDERS \leftarrow ORDER \mid><\mid_{ORDER.Order\# = SHIPMENT.Order\#} SHIPMENT$

$OVERDUE\_ORDERS \leftarrow O_{(Ship\_date - Odate) > 30}(SHIP\_ORDERS)$

Order#	Odate	Cust#	Ord_amt	Warehouse#	Ship_date
1212	2014-01-01	521	$62.62	02	2014-02-06
6231	2014 02-01	612	$13.23	06	2014-04-01

e.

$NEW\_YORK \leftarrow O_{City = 'New\ York'}(WAREHOUSE)$

$NY\_SHIP\_ORDERS \leftarrow NEW\_YORK \mid><\mid_{NEW\_YORK.Warehouse\# = SHIPMENT.Warehouse\#} SHIPMENT$

$\pi_{Order\#}(NY\_SHIP\_ORDERS)$

Order#
3623
1731
5543