a.)

BT <- $\sigma_{\text{Title = 'The Lost Tribe'}}$ (BOOK_COPIES $\bowtie_{\text{BC.Book_id=B.Book_id}}$ (BOOK))

Result <- $\pi_{\text{No_of_copies}}$ ($\sigma_{\text{Branch_name = 'Sharpstown'}}$ (BT $\bowtie_{\text{BT,Branch_id = LB.Branch_id}}$ (LIBRARY_BRANCH)))

SQL:

```
SELECT DISTINCT No_of_copies
FROM BOOK_COPIES, BOOK, LIBRARY_BRANCH
WHERE Title = 'The Lost Tribe' AND BT.Book_id = B.Book_id AND BT.Branch_id = LB.Branch_id
AND Branch_name = 'Sharpstown'
```

c.)

Result <- π_{Name} (($\pi_{\text{Card_no}}$ (BORROWER) – $\pi_{\text{Card_no}}$ (BOOK_LOANS)) $\bowtie_{\text{B1.Card_no = B2.Card_no}}$ (BORROWER))

SQL:

```
SELECT DISTINCT Name
FROM BORROWER, BOOK_LOANS
WHERE NOT EXISTS ( SELECT * FROM BOOK_LOANS B1.Card_no = B2.Card_no);
```

e.)

R(Branch_name, T) <- $_{\text{Branch_name}}\mathcal{F}_{\text{COUNT(Date_out)}}$ (LIBRARY_BRANCH $\bowtie_{\text{L.Branch_id = BL.Branch_id}}$ (BOOK_LOANS))

Result <- $\pi_{\text{Branch_name, T}}$ (R)

SQL:

```
SELECT DISTINCT Branch_name, T
FROM LIBRARY_BRANCH, BOOK_LOANS
WHERE L.Branch.id = BL.Branch_id
GROUP BY Branch_name;
```

g.)

A1 <- $\pi_{\text{Branch\_id, Title, No\_of\_copies}} (\sigma_{\text{Author\_name = 'Stephen King'}} (\text{BOOK} \bowtie_{\text{B1.Book\_id = BA.Book\_id}} (\text{BOOK\_AUTHORS})) \bowtie_{\text{B2.Book\_id = BC.Book\_id}} (\text{BOOK\_COPIES}))$

Result <- $\pi_{\text{Title, No\_of\_copies}} (\sigma_{\text{Branch\_name = 'Central'}} (\text{LIBRARY\_BRANCH} \bowtie_{\text{LB.Branch\_id = A1.Branch\_id}} (\text{A1})))$

SQL:

```
SELECT Title, No_of_copies

FROM BOOK, BOOK_AUTHORS, BOOK_COPIES, LIBRARY_BRANCH

WHERE Branch_name = 'Central' AND Author_Name = 'Stephen King' AND B1.Book_id =
BA.Book_id AND B2.Book_id = BC.Book_id AND LB.Branch_id = A1.Branch_id
```