2.44 Find the books that have been reviewed by every borrower who has ever checked them out.

Answer

$$
\begin{aligned}
L &\leftarrow \pi_{BookID,CardNo}(\text{BOOK_LOANS}) \\
R &\leftarrow \pi_{BookID,CardNo}(\text{BOOK_REVIEWS}) \\
Missing &\leftarrow L - R \\
BadBooks &\leftarrow \pi_{BookID}(Missing) \\
GoodBooks &\leftarrow \pi_{BookID}(L) - BadBooks \\
Answer &\leftarrow \pi_{BookID,Title}(GoodBooks \bowtie \text{BOOK})
\end{aligned}
$$

2.45 List the card numbers and names of the borrowers who have reserved at least one study room in every library branch that has a study room.

Answer

$$
\begin{aligned}
Branches &\leftarrow \pi_{BranchID}(\text{MEETING_ROOM}) \\
Bookings &\leftarrow \pi_{CardNo,BranchID}(\text{ROOM_RESERVATION} \bowtie \text{MEETING_ROOM}) \\
Qualified &\leftarrow Bookings \div Branches \\
Answer &\leftarrow \pi_{CardNo,Name}(Qualified \bowtie \text{BORROWER})
\end{aligned}
$$

2.46 Retrieve the card number and name of the borrowers who have at least one book on their wishlist and have written a review for every book on their wishlist. The review may have any rating.

Answer

$$
\begin{aligned}
W &\leftarrow \pi_{CardNo,BookID}(\text{NEW_BOOK_WISHLIST}) \\
R &\leftarrow \pi_{CardNo,BookID}(\text{BOOK_REVIEWS}) \\
WishBorrowers &\leftarrow \pi_{CardNo}(W) \\
Missing &\leftarrow W - R \\
BadBorrowers &\leftarrow \pi_{CardNo}(Missing) \\
Qualified &\leftarrow WishBorrowers - BadBorrowers \\
Answer &\leftarrow \pi_{CardNo,Name}(Qualified \bowtie \text{BORROWER})
\end{aligned}
$$

2.47 For each book that has at least one review, retrieve its title and the card number, name, and rating of every borrower whose rating is the highest distinct rating received by that book. Include all ties.

Answer

$$
\begin{aligned}
MaxRatings &\leftarrow {}_{BookID}\mathcal{G}_{\text{MAX}(Rating)\rightarrow MaxRating}(\text{BOOK_REVIEWS}) \\
ReviewMax &\leftarrow \text{BOOK_REVIEWS} \bowtie MaxRatings \\
TopReviews &\leftarrow \sigma_{Rating=MaxRating}(ReviewMax) \\
Details &\leftarrow TopReviews \bowtie \text{BOOK} \bowtie \text{BORROWER} \\
Answer &\leftarrow \pi_{Title,CardNo,Name,Rating}(Details)
\end{aligned}
$$