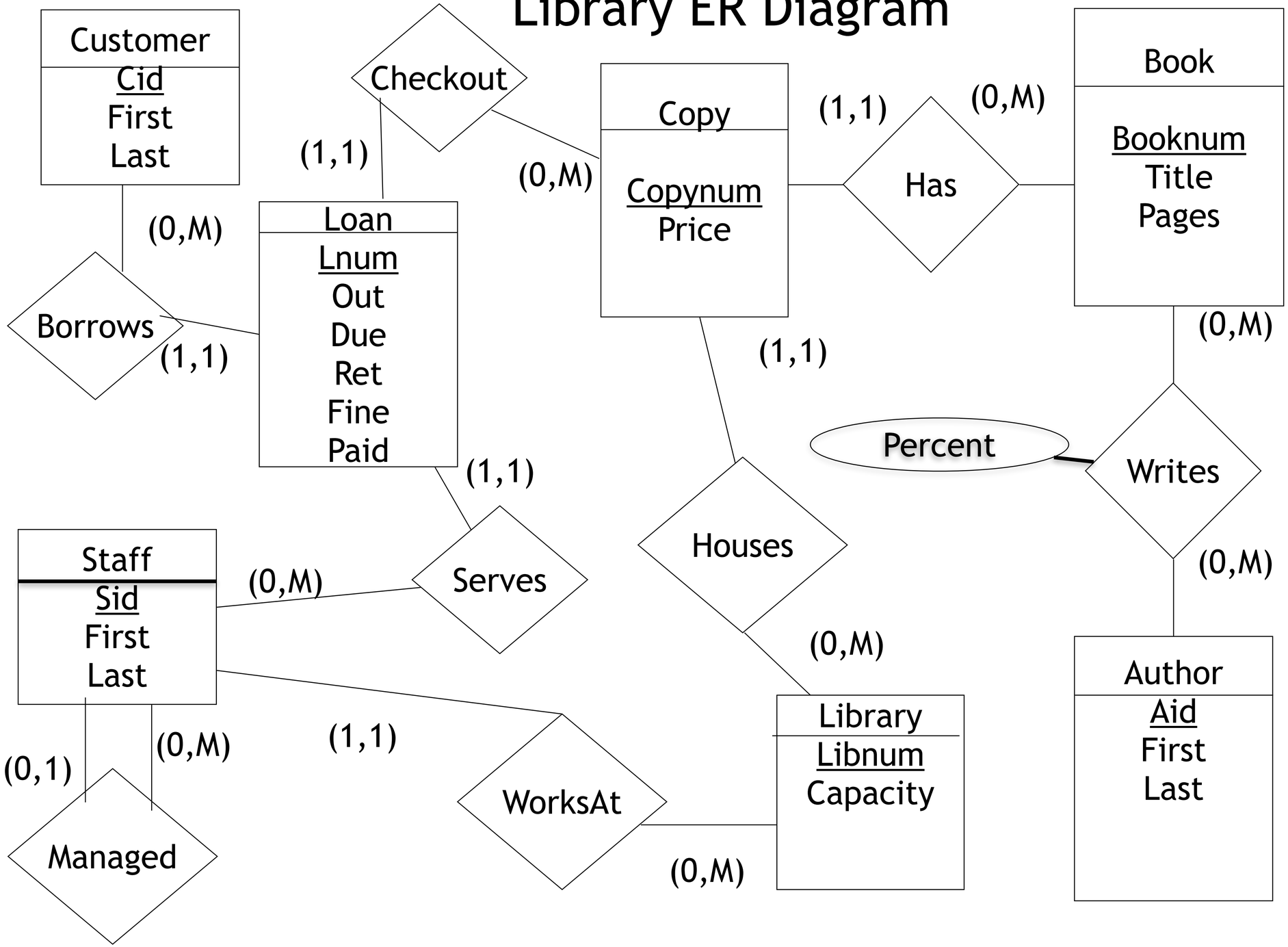
Quiz 9 Solution

Library ER Diagram



Quiz 9 Solution

Author **A**

Writes **W**

Book **B**

Copy **Co**

Library **L**

Loan **Lo**

Customer **Cu**

1. Find the cid, first and last of customers who have borrowed a copy of a book titled Ada.

—(π cid, first, last(σ$_{\text{title = 'Ada'}}$ (Cu ⋈ Lo ⋈ Co ⋈ B)))

2. Find the booknum and title of books borrowed by **all customers** who have used library 10. The phrase "used library 10" means the customer has borrowed a copy of a book housed in library 10.

– $(\pi_{\text{booknum, title, cid}}(\text{Lo} \bowtie \text{Co} \bowtie \text{B})) \;/\; (\pi_{\text{cid}}(\sigma_{\text{libnum = 10}}(\text{Lo} \bowtie \text{Co} \bowtie \text{L})))$

3. Suppose the Book table contains 10,000 rows and there are 50 rows per page. Also suppose there are 101 main memory page buffers that can be used for sorting. How many secondary memory accesses (reads and writes) will be done in order to sort the Book table? Use the external sorting algorithm (i.e. partial sort then k-way merging) described in the lecture on external sorting.

Total Pages: 10000/50 = 200 pages
Partial Sort: Read 101 pages, sort, write 101 sorted pages
Read 99 pages, sort, write 99 sorted pages
(101+99) reads + (101+99) writes = 400 secondary memory accesses

Merge Phase: Merge 2 sorted sequences into a single sorted sequence
Since this only requires 3 buffers only one merge phase is required
200 reads + 200 writes = 400 secondary memory accesses

Partial Sort + One Merge Phase = 400+400 = 800 secondary memory accesses

Directly using the formula: $2*200*\text{ceiling}(\log_{100} 200) = 400 * 2 = 800$ secondary memory accesses