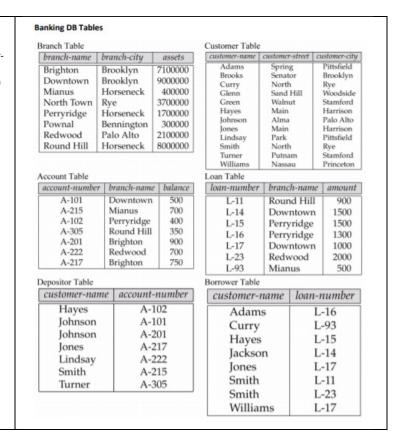
Module Exercise 7.5: CS 5012: RA Banking

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Banking DB Schema

- branch (branch-name, branch-city, assets)
- customer (<u>customer-name</u>, customer-street, customercity)
- account (account-number, branch-name (FK), balance)
- loan (<u>loan-number</u>, branch-name (FK), amount)
- depositor (<u>customer-name</u>, account-number (FK))
- borrower (<u>customer-name</u>, loan-number (FK))



Questions

- 1. Find all loans over \$1200.
 - a. $\sigma_{(amount>1200)}(loan)$
 - b. Results in:

loan-number	branch-name	amount
L-14	Downtown	1500
L-15	Perryridge	1500
L-16	Perryridge	1300
L-23	Redwood	2000

- 2. Find the loan number for each loan of an amount greater than \$1200.
 - a. $\pi_{loan-number}(\sigma_{(amount>1200)}(loan))$
 - b. Results in:

loan-number
L-14
L-15
L-16
L-23

- 3. Find the names of all customers who have a loan, an account, or both from the bank.
 - a. $\pi_{(customer-name)}((customer \bowtie depositor) = \bowtie = (customer \bowtie borrower))$
 - b. Results in:

customer-name
Hayes
Johnson
Jones
Lindsay
Smith
Turner
Adams
Curry
Jackson
Williams

- ⋈ enforces equality on shared attributes (customer-name)
- =⋈=pads with nulls any accounts-number or loan-number that isn't available for the join on customer-name
- π removes duplicates
- 4. Find the names of all customers who have a loan and an account at the bank.
 - a. $\pi_{(customer-name)}(depositor \bowtie borrower)$
 - b. Results in:

customer-name
Hayes
Jones
Smith

- c. ⋈ enforces equality on shared attributes (customer-name)
- 5. Find the names of all customers who have a loan at the Perryridge branch.
 - a. $\pi_{(customer-name)}(borrower \bowtie \sigma_{(branch-name="Perryridge")}(loan))$
 - b. Results in:

customer-name	
Hayes	
Adams	

- c. ⋈ enforces equality on shared attributes (loan-number)
- 6. Find the names of all customers who have a loan at the Perryridge branch, but no account at any branch of the bank.
 - a. $\pi_{(customer-name)}(borrower \bowtie \sigma_{(branch-name="Perryridge")}(loan)) \pi_{(customer-name)}(depositor)$
 - b. Results in:

customer-name	
Adams	

c. — finds tuples in the first projection but not the second.

- 7. Find the names of all customers who have an account at the Downtown and Mianus branches.
 - a. $\pi_{(customer-name)}((depositor \bowtie \sigma_{(branch-name="Downtown")}(account)) \bowtie (depositor \bowtie \sigma_{(branch-name="Mianus")}(account)))$
 - b. Results in an empty tuple.
- 8. Find the total amount each branch has in accounts.
 - a. $\pi_{(branch-name, assets)}(branch)$
 - b. The above assumes that total amount the branch has in its accounts is the amount in the assets column of the relation.
- 9. Find the average loan amount of each customer.
 - a. customer-name \mathcal{G} $avg_{(amount)}(\pi_{(customer-name,amount)}(borrower \bowtie \pi_{(loan-number,amount)}(loan))$
 - b. Left join the Borrower relation on the projection of loan-number and amount from the Loan relation. From that join, project customer-name and amount. Then, by customer-name, aggregate the average loan amount.
- 10. Find the names of all customers who have an account at every branch located in Brooklyn.
 - a. $\pi_{(customer-name)}(\pi_{(customer-name,branch-name)}(depositor \bowtie account)\% \left(\pi_{(branch-name)}(\sigma_{(branch-city="Brooklyn")}branch)\right))$
 - b. Use the division operator to only return records that match both the branch-names in branches from Brooklyn.