DataBase System Concept Homework # 1
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Problem 1 (2.7)**.** *Consider the bank database of Figure 2.18. Give an expression in the relational algebra for each of the following queries:*

1. *Find the name of each branch located in "Chicago".*
2. *Find the ID of each borrower who has a loan in branch "Downtown".*

Solution. The information we need for the first question are in the table *branch*.

$$\Pi_{branch\_name}(\sigma_{branch\_city="Chicago"}(branch))$$

For the second question, we need to use the table *borrower* and *loan*. Since they share the attribute *loan_number*, I choose to use natural join.

$$\Pi_{ID}((\sigma_{branch\_name="Downtown"}(loan)) \bowtie borrower)$$

□

Problem 2 (2.14)**.** *Consider the employee database of Figure 2.17. Give an expression in the relational algebra to express each of the following queries:*

1. *Find the ID and name of each employee who works for "BigBank".*
2. *Find the ID, name, and city of residence of each employee who works for "BigBank".*
3. *Find the ID, name, street address, and city of residence of each employee who works for "BigBank" and earns more than $10000.*
4. *Find the ID and name of each employee in this database who lives in the same city as the company for which she or he works.*

Solution.

$$\Pi_{person\_name}(employee \bowtie \sigma_{company\_name="BigBank"}(works))$$

$$\Pi_{person\_name,city}(employee \bowtie \sigma_{company\_name="BigBank"}(works))$$

$$\Pi_{person\_name,street,city}(employee \bowtie \sigma_{company\_name="BigBank" \wedge salary>10000}(works))$$

$$\Pi_{person\_name}((employee \bowtie works) \bowtie company)$$

where the second natural join guarentee that the selected employee live in the same city as the compnany she or he works for. □

Problem 3 (2.15)**.** *Consider the bank database of Figure 2.18. Give an expression in the relational algebra for each of the following queries:*

1. *Find each loan number with a loan amount greater than $10000.*
2. *Find the ID of each depositor who has an account with a balance greater than $6000.*

3. *Find the ID of each depositor who has an account with a balance greater than $6000 at the "Uptown" branch.*

Solution.

$$\Pi_{loan\_number}(\sigma_{amount>10000}(loan))$$

$$\Pi_{ID}(\sigma_{account\_balance>6000}(account) \bowtie depositor)$$

$$\Pi_{ID}(\sigma_{account\_balance>6000 \wedge branch\_name="Downtown"}(account) \bowtie depositor)$$

to keep the relation relatively small given by the join operations, I use the select operation first. □