branch(branchname, branchcity, assets)
customer (customername, customerstreet, customercity)
loan (loan_number, branchname, amount)
borrower (customername, loan_number)
account (account_number, branchname, balance)
depositor (customername, account_number)

Figure 3.19  Banking database for Exercises 3.8 and 3.15.

3.5  Suppose that we have a relation marks(ID, score) and we wish to assign grades to students based on the score as follows: grade F if score < 40, grade C if 40 ≤ score < 60, grade B if 60 ≤ score < 80, and grade A if 80 ≤ score. Write SQL queries to do the following:
   a. Display the grade for each student, based on the marks relation.
   b. Find the number of students with each grade.

3.6  The SQL like operator is case sensitive, but the lower() function on strings can be used to perform case insensitive matching. To show how, write a query that finds departments whose names contain the string “sci” as a substring, regardless of the case.

3.7  Consider the SQL query

   select distinct p.a1
   from p, r1, r2
   where p.a1 = r1.a1 or p.a1 = r2.a1

   Under what conditions does the preceding query select values of p.a1 that are either in r1 or in r2? Examine carefully the cases where one of r1 or r2 may be empty.

3.8  Consider the bank database of Figure 3.19, where the primary keys are underlined. Construct the following SQL queries for this relational database.
   a. Find all customers of the bank who have an account but not a loan.
   b. Find the names of all customers who live on the same street and in the same city as “Smith”.
   c. Find the names of all branches with customers who have an account in the bank and who live in “Harrison”.

3.9  Consider the employee database of Figure 3.20, where the primary keys are underlined. Give an expression in SQL for each of the following queries.
   a. Find the names and cities of residence of all employees who work for “First Bank Corporation”.


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employee (employee_name, street, city)
works (employee_name, company_name, salary)
company (company_name, city)
manages (employee_name, manager_name)

Figure 3.20 Employee database for Exercises 3.9, 3.10, 3.16, 3.17, and 3.20.

b. Find the names, street addresses, and cities of residence of all employees who work for “First Bank Corporation” and earn more than $10,000.

c. Find all employees in the database who do not work for “First Bank Corporation”.

d. Find all employees in the database who earn more than each employee of “Small Bank Corporation”.

e. Assume that the companies may be located in several cities. Find all companies located in every city in which “Small Bank Corporation” is located.

f. Find the company that has the most employees.

g. Find those companies whose employees earn a higher salary, on average, than the average salary at “First Bank Corporation”.

3.10 Consider the relational database of Figure 3.20. Give an expression in SQL for each of the following queries.

a. Modify the database so that “Jones” now lives in “Newtown”.

b. Give all managers of “First Bank Corporation” a 10 percent raise unless the salary becomes greater than $100,000; in such cases, give only a 3 percent raise.

Exercises

3.11 Write the following queries in SQL, using the university schema.

a. Find the names of all students who have taken at least one Comp. Sci. course; make sure there are no duplicate names in the result.

b. Find the IDs and names of all students who have not taken any course offering before Spring 2009.

c. For each department, find the maximum salary of instructors in that department. You may assume that every department has at least one instructor.

d. Find the lowest, across all departments, of the per-department maximum salary computed by the preceding query.