

### Assignment 3

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1. Retrieve names of all employees in department 5 who work more than 10 hours per week on the ProductX project.

A.

$Res1 \leftarrow Employee \bowtie_{SSN=ESSN} Works\_on \bowtie_{PND=PNumber} Project$

$Res2 \leftarrow \sigma_{DNO=5 \text{ AND } PNAME='ProductX' \text{ AND } HOURS > 10}(Res1)$

$Result \leftarrow \pi_{PNAME, LNAME}(Res2)$

2. List the names of all employees who have a dependent with the same first name as themselves

A.

$Res1 \leftarrow Employee \bowtie_{SSN=ESSN} \text{ AND } FNAME = \text{Dependent\_name Dependent}$

$Result \leftarrow \pi_{Fname, Lname}(Res1)$

3. Find the names of all employees who are directly supervised by 'Franklin Wong'

A.  $Res1 \leftarrow \pi_{SSN}(\sigma_{Lname='Wong' \text{ and } Fname='Franklin'}(Employee))$

$Res \leftarrow \pi_{Fname, lname}(Employee \bowtie_{Super\_SSN=SSN} Res1)$

4. For each project, list the name of and total hours per week (by all employees) spent on that project.

A.

Res1 (Pno, Total)  $\leftarrow$  Pno  $\bowtie$  SUM hours (Works\_on)

Result  $\leftarrow \pi_{Pname, total} (Res1 \bowtie_{PNO = Pnumber} Project)$

5. Retrieve the names of all employees who works on every project.

A.

Res1 (SSN, Pnumber)  $\leftarrow \pi_{ESSN, PNO} (Works\_on)$

Res2  $\leftarrow \pi_{Pnumber} (Projects)$

Result  $\leftarrow \pi_{FName, LName} ((Res1 \div Res2) * Employees)$

6. Retrieve names of all employees who do not work on any project

A.

Res1  $\leftarrow Employees * (\pi_{ESSN} (Works\_on))$

Result  $\leftarrow \pi_{FName, LName} (Employee - Res1)$

7. For each department, retrieve the name of department and the average salary of all employees working in that department

A.  $Res1 \leftarrow \pi_{DNO, \text{Average}} (DNO \bowtie \overset{\text{AVERAGE}}{\text{AVG salary}} (Employee))$

$Result \leftarrow \pi_{DName, \text{Average}} (Res1 * Department)$

8. Retrieve the average salary of all female employees.

A.

$Result \leftarrow \text{Average salary} (\sigma_{sex='Female'} (Employee))$

9. Find the names and addresses of all employee who work on at least one project located in Houston but whose department has no location in Houston

A.

$Res1 \leftarrow \pi_{fname, lname, address} (\sigma_{plocation='Houston'}$

$(employees *_{(SSN), (ESSN)} \overset{\text{WORKS ON}}{WORKS ON} *_{(Pno), (Pnumber)} Project))$

$Res2 \leftarrow \pi_{fname, lname, address} (\sigma_{dlocation='Houston'} (employees *_{(dno), (dnumber)} dept\_location))$

$(dnumber) dept\_location))$

$Result \leftarrow Res1 - Res2$



10. List the last names of all department managers who have no dependents.

A.

$Res1_{(SSN)} \leftarrow \pi_{mgrSSN} (department) - \pi_{SSN} (dependent)$

$\pi_{lname, lname} (Res1 \bowtie Employees)$   
 $(Res1.SSN = Employees.SSN)$

11. Find all books that are borrowed from 'Richardson' library branch.

A.

$Res1 \leftarrow Book \bowtie Book\_LOANS$   
 $(Book.Book\_id = Book\_LOANS.Book\_id)$

$Res2 \leftarrow Res1 \bowtie LIBRARY\_BRANCH$   
 $(Res1.Branch\_id = library\_branch.Branch\_id)$

$\pi_{title} (\sigma_{Branch\_name = 'Richardson'} (Res2))$

12. Find all books that are overdue.

A.  $Res1 \leftarrow \sigma_{(due\_date < today) \text{ AND } (Return\_date = NULL)}$   
 $(Book\_loans)$

$\pi_{title} (Res1 \bowtie Book (Res1.book\_id = Book.book\_id))$

13. For each library branch, find total number of books that are overdue.

A.

Res1  $\leftarrow \sigma_{\text{Book\_loans}} \begin{matrix} (\text{due\_date} < \text{today}) \text{ AND} \\ (\text{return\_date} = \text{NULL}) \end{matrix}$

Res2  $\leftarrow (\text{Res1} \bowtie \text{library\_branch})$   
 $(\text{Res1.branch\_id} = \text{library\_branch.branch\_id})$

Res3  $\leftarrow (\text{Branch\_name}) \underset{\text{COUNT}}{f} (\text{Book\_id}) \text{ Res2}$

$\Pi_{\text{Branch\_name, COUNT Bookid}} \text{Res3}$

14. Retrieve the names of all borrowers who have overdue books.

A.

Res1  $\leftarrow \text{Borrower} \bowtie \text{Book\_loans}$

$\text{Borrower.card\_no} = \text{Book\_loans.card\_no}$

Res2  $\leftarrow \sigma_{(\text{due\_date} < \text{today}) \text{ AND } \text{Res1}}$

$\Pi_{\text{name}} (\text{Res2})$

15. Retrieve the names of all borrowers who do not have any books checked out.

A. Res1  $\leftarrow \Pi_{\text{card\_no}} (\text{Borrower}) - \Pi_{\text{card\_no}} (\text{Book\_loans})$

Result  $\leftarrow \pi_{\text{name}} (\text{Borrower} \times \text{Res1})$

16. For each book that is checked out from the "richardson" library branch and whose due date today, retrieve the book title, borrower name, and borrower address

A. Res1  $\leftarrow \sigma_{\text{(Due\_date=today)} \text{ AND } \text{(Branch\_name = "Richardson")}} (\text{Book\_loans} \bowtie \text{library\_branch})$

Res2  $\leftarrow \text{Res1} \bowtie \text{Borrower}$

Result  $\leftarrow \pi_{\text{title, name, address}} (\text{Book} \bowtie \text{Res2})$

17. For each library branch, retrieve the branch name and the total number of books loaned out from that branch.

A.

Res1  $\leftarrow \sigma_{\text{(return\_date=null)}} (\text{Book\_loans})$

Res2  $\leftarrow \text{Res1} \bowtie \text{Library\_branch}$

Res3  $\leftarrow \text{Branch\_name} \mid \text{COUNT}(\text{Book\_id}) \text{ Res2}$

Result  $\leftarrow \pi_{\text{Branch\_name, COUNT}} \text{ Res3}$



18. Retrieve the names, address and number of books checked out for all borrowers who have more than five books checked out.

A.

Res 1  $\leftarrow \sigma_{(Borrower \bowtie Book\_loans)}^{(Return\_date = null)}$   
(card\_no)

Res 2  $\leftarrow (Card\_no) \text{ f COUNT } Res 1$   
(Book\_id)

Result  $\leftarrow \pi_{name, address, COUNT} (\sigma_{(COUNT > 5)}^{Res 2})$