Safari Queries
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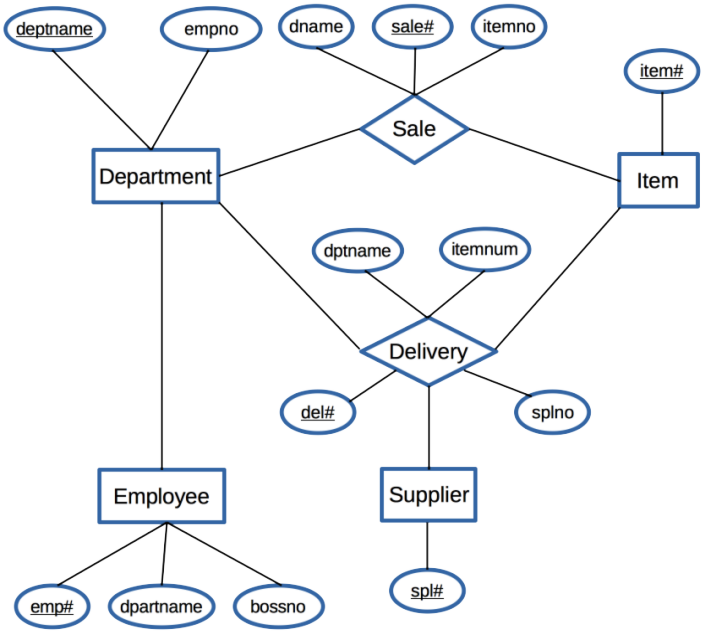
Schema:

sale (sale#, saleqty, itemno, dname)
supplier (spl#, splname)
item (item#, itemname, itemtype, itemcolor)
department (deptname, deptfloor, deptphone, empno)
delivery (del#, delqty, itemnum, dptname, splno)
employee (emp#, empfname, empsalary, departname, bossno)

ER Diagram:



Relationships:
Supplier *delivers* **Item** to **Department**. (many to many)
Department *sells* **Item**. (many to many)
Employee *manages* **Employee**. (one to many)
Employee *works at* **Department**. (many to one)
Department *is managed by* **Employee**. (one to one)

1. What are the names of the suppliers?

$$\pi_{splname}(supplier)$$

LEAP Query:
q1r1 = project (supplier) (splname)

2. What are the names of the employees in Marketing?

$$\pi_{empfname}(\sigma_{departname='Marketing'}(employee))$$

LEAP Query:
q2r1 = select (employee) (departname="Marketing")
q2r2 = project (q2r1) (empfname)

3. What is the Cartesian Product of the suppliers' names and the departments' names?

$$\pi_{splname}(supplier) \times \pi_{deptname}(department)$$

LEAP Query:
q3r1 = (project (supplier) (splname)) product (project (department) (deptname))

4. What are the item numbers of the items sold by the departments located on the second floor? (You must not use JOIN for this query)

$$\pi_{itemno}(\sigma_{dname=deptname}(sale \times (\sigma_{deptfloor=2}(department))))$$

LEAP Query:
q4r1 = (sale) product (department)
q4r2 = select (q4r1) (dname=deptname)
q4r3 = select (q4r2) (deptfloor='2')
q4r4 = project (q4r3) (itemno)

5. What are the item numbers of the items sold by the departments located on the second floor? (You must use JOIN for this query)

$$\pi_{itemno}(\sigma_{deptfloor=2}(department) \bowtie_{deptname=dname} sale)$$

LEAP Query:
q5r1 = join (department) (sale) (deptname=dname)
q5r2 = project (select (q5r1) (deptfloor='2')) (itemno)

6. For each item, give its type, the departments that sell it, and the floor number of these departments.

$$\pi_{item\#,itemtype,dname,deptfloor}((item \bowtie_{item\#=itemno} sale) \bowtie_{dname=deptname} department)$$

LEAP Query:
q6r1 = join (item) (sale) (item#=itemno)
q6r2 = join (q6r1) (department) (dname=deptname)
q6r3 = project (q6r2) (itemno, itemtype, dname, deptfloor)

7. List the numbers of the items delivered by Nepalese Corp or sold in the Navigation department.

$$(\pi_{itemno}(\sigma_{dname='Navigation'} sale)) \cup (\pi_{itemnum}(\sigma_{splname='Nepalese\_Corp'} supplier \bowtie_{spl\#=splno} delivery))$$

LEAP Query:
q7r1 = project (select (sale) (dname="Navigation")) (itemno)
q7r2 = join (select (supplier) (splname="Nepalese_Corp")) (delivery) (spl#=splno)
q7r3 = project (q7r2) (itemnum)
q7r4 = (q7r1) union (q7r3)

8. What are the names of the items sold on floors other than the second floor?

$$\rho(TmpItem, \pi_{itemno}(sale \bowtie (\sigma_{deptfloor \neq 2} department)))$$
$$\pi_{itemname}(TmpItem \bowtie_{itemno=item\#} item)$$

LEAP Query:
q8r1 = select (department)(deptfloor <> '2')
q8r2 = join (q8r1) (sale) (deptname = dname)
q8r3 = project (q8r2) (itemno)
q8r4 = join (q8r3) (item) (itemno = item#)
q8r5 = project (q8r4) (itemname)

9. Find the names of the items sold by no department on the second floor.

$$\rho(TmpItem1, \pi_{itemno}(sale \bowtie (\sigma_{deptfloor=2} department)))$$
$$\rho(TmpItem2, (\sigma_{itemno} sale) - TmpItem1)$$
$$\pi_{itemname}(TmpItem2 \bowtie item)$$

LEAP Query:
q9r1 = join (select (department) (deptfloor='2')) (sale) (deptname=dname)
q9r2 = (project (sale) (itemno)) difference (project (q9r1) (itemno))
q9r3 = project (join (q9r2) (item) (item# = itemno)) (itemname)

10. List the item numbers of the items delivered by Nepalese Corp and sold in the Navigation department. (You must use $\cap$)

$$(\pi_{itemno}(\sigma_{dname='Navigation'} sale)) \cap (\pi_{itemnum}(\sigma_{splname='Nepalese\_Corp'} supplier \bowtie_{spl\#=splno} delivery))$$

LEAP Query:
q10r1 = project (select (sale) (dname="Navigation")) (itemno)
q10r2 = join (select (supplier) (splname="Nepalese_Corp")) (delivery) (spl#=splno)
q10r3 = project (q10r2) (itemnum)
q10r4 = (q10r1) intersect (q10r3)

11. What are the names of the suppliers of Pith helmets sold in a department managed by Andrew?

$$\rho(TmpDep, department \bowtie \sigma_{empfname='Andrew'} employee)$$
$$\rho(TmpSale, sale \bowtie \sigma_{itemname='Pith\_helmet'} item)$$
$$\rho(TmpDepSale, TmpDep \bowtie TmpSale)$$
$$\rho(TmpDelivery, delivery \bowtie \sigma_{itemname='Pith\_helmet'} item)$$
$$\rho(TmpDelSup, TmpDelivery \bowtie supplier)$$
$$\pi_{splname}(TmpDepSale_{dptname=dname} \bowtie TmpDelSup)$$

LEAP Query:
q11r1 = join (department) (select (employee) (empfname="Andrew")) (empno = emp#)
q11r2 = join (sale) (select (item) (itemname="Pith_helmet")) (itemno = item#)
q11r3 = join (q11r1) (q11r2) (dname=deptname)
q11r4 = join (delivery) (select (item) (itemname="Pith_helmet")) (itemnum = item#)
q11r5 = join (q11r4) (supplier) (splno = spl#)
q11r6 = join(q11r5) (q11r3) (dptname=deptname)
q11r7 = project (q11r6) (splname)

12. What are the item numbers of the items sold by all departments on the second floor? (You must use division)

$$\rho(TmpDep, \pi_{deptname}(\sigma_{deptfloor=2}department))$$
$$\rho(TmpSale, \pi_{itemno,dname}(sale))$$
$$TmpSale - ((\pi_{item\#}item \times TmpDep) - TmpSale)$$

q12r1 = project (select (department) (deptfloor='2')) (deptname)
q12r11 = join (sale) (q12r1) (deptname=dname)
q12r2 = project (q12r11) (itemno, dname)
q12r3 = project (item) (item#)
q12r4 = ((q12r3) product (q12r1)) difference (q12r2)
q12r5 = (project (q12r2) (itemno)) difference (project (q12r4) (itemno))