# SOFTENG 351: Lab #6

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# 1)

## a)

$PROD\_EMPS \leftarrow (\sigma_{Pname="ProductX"}((EMPLOYEE \bowtie_{Ssn=Essn} WORKS\_ON) \bowtie_{Pno=Pnumber} PROJECT))$

$RESULT \leftarrow \pi_{Fname,\, Lname}(\sigma_{Hours>10\ AND\ Dno=5} PROD\_EMPS)$

| Fname | Lname |
|---|---|
| John | Smith |
| Joyce | English |

## b)

$PROJ\_WORKS \leftarrow PROJECT \bowtie_{Pno=Pnumber} WORKS\_ON$

$PROJ\_HOURS \leftarrow {}_{Pnumber}\Im_{SUM\ Hours}(PROJ\_WORKS)$

$RESULT \leftarrow \pi_{Pname,\, Sum\_hours}(PROJECT \bowtie_{Pno=Pnumber} PROJ\_HOURS)$

| Pname | Sum_hours |
|---|---|
| ProductX | 52.5 |
| ProductY | 37.5 |
| ProductZ | 50.0 |
| Computerization | 55.0 |
| Reorganization | 25.0 |
| Newbenefits | 55.0 |

## c)

$DEP\_SALARY \leftarrow {}_{Dno}\Im_{Average\ Salary}(EMPLOYEE)$

$RESULT \leftarrow \pi_{Dname,\, Average\_salary}(DEPARTMENT \bowtie_{Dno=Dnumber} DEP\_SALARY)$

| Dname | Average_salary |
|---|---|
| Research | 33250 |
| Administration | 31000 |
| Headquarters | 55000 |

## d)

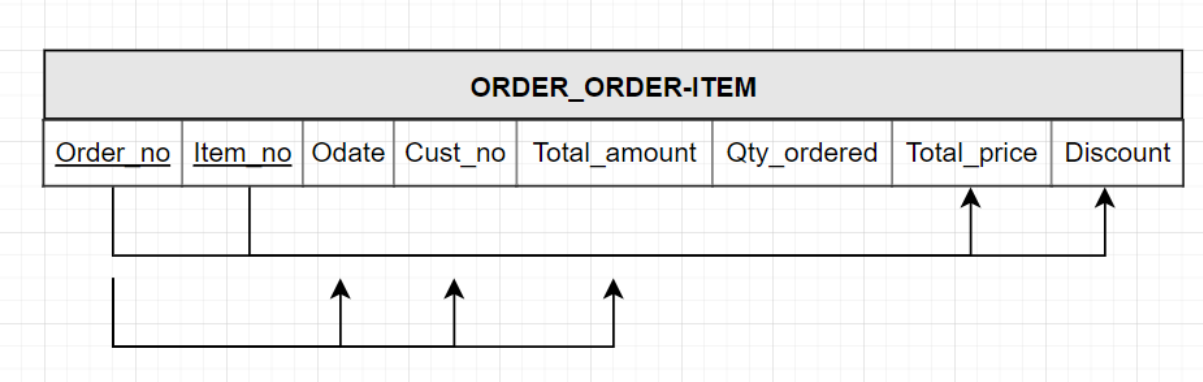
$MAN\_DEPEND(Mgr\_ssn) \leftarrow DEPENDENT \bowtie_{Essn=Mgr\_ssn} DEPARTMENT$

$MAN\_NO\_DEPEND \leftarrow \pi_{Mgr\_ssn}(DEPARTMENT) - MAN\_DEPEND$

$RESULT \leftarrow \pi_{Lname}(MAN\_NO\_DEPEND \bowtie_{Mgr\_ssn=Ssn} EMPLOYEE)$

| Lname |
|---|
| Borg |

## 2)




In order to prove that a relation schema is 2NF, we need to show that all non-prime attributes are fully functionally dependent on the primary key. Therefore, it needs to be shown that the removal of either Order_no or Item_no would violate functional dependency. If Order_no was removed, then Odate would not be unique value, assuming that Odate can be the same for two orders. This shows that the relational schema is not 2NF.

As the relational schema is not 2NF, it is also not 3NF.