WEEK 6

DOING A DIVISION IN TUPLE RELATIONAL CALCULUS

STUDENT OBJECTIVES

- Upon completion of this video, you should be able to:
  - Understand the tuple relational calculus statement that will answer the query using DIVISION

We will be using the following tables for our discussion and examples:

Employee

FName	Minit	Lname	SSN	BDate	Address	Sex	Salary	SuperSSN*	DNO*

Department

DName	DNumber	MGRSSN*	MgrStartDate

Works_On

ESSN*	PNO*	Hours

DepartmentLocation

Dnumber*	Dlocation

Project

PName	PNumber	Plocation	Dnum*

Dependent

ESSN*	DependentName	Sex	BDate	Relationship

Question: Write the query to find the names of all employees who work on ALL the projects controlled by department number 5.

{e.Firstname, e.Lastname | EMPLOYEE(e) AND ((∀x)(NOT (PROJECT(x)) or (NOT (x.DNUM = 5) or ((∃w) (WORKSON(w) and w.ESSN = e.SSN and x.PNUMBER= w.PNO)))))}

Employee

FName	Minit	Lname	SSN	BDate	Address	Sex	Salary	SuperSSN*	DNO*

Department

DName	DNumber	MGRSSN*	MgrStartDate

Works On

ESSN*	PNO*	Hours

DepartmentLocation

Dnumber*	Dlocation

Project

PName	PNumber	Plocation	Dnum*

Dependent

ESSN*	DependentName	Sex	BDate	Relationship

Similar to Division in Relational Algebra

- Consider: Suppose we have an employee who doesn't work on one of the projects controlled by department 5 (Let's say there are 4 projects controlled by department 5 and he only works on 3 of them). We will look at that last project that he doesn't work on:
  - x, a tuple from the project table, which is controlled by dept 5, will be in the project table so NOT(PROJECT(x)) = FALSE
  - have a DNUM=5 so NOT(x.DNUM=5) = FALSE
  - but there will not exist a w in the WORKSON table where w.PNO = x.PNUMBER and w.ESSN=e.SSN so that will be FALSE
  - thus we have (F or F or F) = FALSE and the FORALL x is now F because there is one x that it is false for, thus it is not true for all x

{e.Firstname, e.Lastname | EMPLOYEE(e) AND ((∀x)(NOT (PROJECT(x)) or (NOT (x.DNUM = 5) or ((∃w) (WORKSON(w) and w.ESSN = e.SSN and x.PNUMBER= w.PNO))))))}

- 2. If we assume that x is not in the PROJECT table then for all x, the predicate would be true (so display all employees since there are no projects, you could say all the employees work on all the projects controlled by dept 5 since there are 0 projects and everyone works on 0 projects), but there must be some project tuples so it is FALSE
  - we will assume that x is in the PROJECT table but let's also assume, none of the tuples = 5 then since there are no projects controlled by department 5 you could say all the employees work on all the projects controlled by dept 5 since there are 0 projects and everyone works on 0 projects), if there are some projects that are project 5, then NOT(x.DNUM=5) is false
  - let's assume that x is all the tuples that are in the project table and are 5, there must exist a corresponding workson tuple for every one of the x tuples for this to be true

{e.Firstname, e.Lastname | EMPLOYEE(e) AND ((∀x)(NOT (PROJECT(x)) or (NOT (x.DNUM = 5) or ((∃w) (WORKSON(w) and w.ESSN = e.SSN and x.PNUMBER= w.PNO))))}