



WEEK 6

DOING A DIVISION IN TUPLE RELATIONAL CALCULUS

don't have to write in exam.

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	<u>SSN</u>	BDate	Address	Sex	Salary	SuperSSN*	DNO*
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Department

DName	<u>DNumber</u>	MGRSSN*	MgrStartDate
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Works On

<u>ESSN*</u>	<u>PNO*</u>	Hours
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DepartmentLocation

<u>Dnumber*</u>	<u>Dlocation</u>
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Project

PName	<u>PNumber</u>	Plocation	Dnum*
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Dependent

<u>ESSN*</u>	<u>DependentName</u>	Sex	BDate	Relationship
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Question: Write the query to find the names of all employees who work on ALL the projects controlled by department number 5.

$\{e.Firstname, e.Lastname \mid EMPLOYEE(e) \text{ AND } ((\forall x)(\text{NOT } (PROJECT(x)) \text{ or } (\text{NOT } (x.DNUM = 5) \text{ or } ((\exists w) (WORKSON(w) \text{ and } w.ESSN = e.SSN \text{ and } x.PNUMBER = w.PNO))))))\}$

Employee

FName	Minit	Lname	<u>SSN</u>	BDate	Address	Sex	Salary	SuperSSN*	DNO*
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Department

DName	<u>DNumber</u>	MGRSSN*	MgrStartDate
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Works On

<u>ESSN*</u>	<u>PNO*</u>	Hours
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DepartmentLocation

<u>Dnumber*</u>	<u>Dlocation</u>
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Project

PName	<u>PNumber</u>	Plocation	Dnum*
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Dependent

<u>ESSN*</u>	<u>DependentName</u>	Sex	BDate	Relationship
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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 $\text{NOT}(\text{PROJECT}(x)) = \text{FALSE}$
 - have a $\text{DNUM}=5$ so $\text{NOT}(x.\text{DNUM}=5) = \text{FALSE}$
 - but there will not exist a w in the WORKSON table where $w.\text{PNO} = x.\text{PNUMBER}$ and $w.\text{ESSN} = e.\text{SSN}$ so that will be FALSE
 - thus we have $(\text{F or F or F}) = \text{FALSE}$ 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

$\{e.\text{Firstname}, e.\text{Lastname} \mid \text{EMPLOYEE}(e) \text{ AND } ((\forall x)(\text{NOT}(\text{PROJECT}(x)) \text{ or } (\text{NOT } (x.\text{DNUM} = 5) \text{ or } ((\exists w) (\text{WORKSON}(w) \text{ and } w.\text{ESSN} = e.\text{SSN} \text{ and } x.\text{PNUMBER} = w.\text{PNO}))))))\}$

- 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 $\text{NOT}(x.\text{DNUM}=5)$ 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

$\{e.\text{Firstname}, e.\text{Lastname} \mid \text{EMPLOYEE}(e) \text{ AND } ((\forall x)(\text{NOT}(\text{PROJECT}(x)) \text{ or } (\text{NOT } (x.\text{DNUM} = 5) \text{ or } ((\exists w) (\text{WORKSON}(w) \text{ and } w.\text{ESSN} = e.\text{SSN} \text{ and } x.\text{PNUMBER} = w.\text{PNO}))))))\}$