Tutorial 3, Relational Algebra

List all teachers and their rooms

This only refers to the Teachers relation. No selection is specified.

 $\pi_{name,room}(Teachers)$

But this is just the same as:

Teachers

Find the number of students for all courses

The answer can be projected from relation Courses

 $\pi_{name,nrStudents}(Courses)$

For each course, find the room where it is held

Relations Courses and Teachers are required to answer this question. Both relations have an attribute called "name", so table names must be used to disambiguate these.

 $\pi_{Courses.name,room}(\sigma_{teacher=Teachers.name}(Courses \times Teachers))$

However, the following equivalence rule can be used to rewrite a Cartesian as a theta-join:

 $\sigma_{\theta}(R_1 \times R_2) = R_1 \bowtie_{\theta} R_2$

So we can rewrite this relational algebra expression as:

 $\pi_{Courses.name,room}(Courses \bowtie_{teacher=Teachers.name} Teachers)$

All teachers who have classes on Mondays

 $\pi_{teacher}(\sigma_{course=name \land day=``Monday''}(Courses \times Classes))$

or

 $\pi_{teacher}(Courses \bowtie_{course=name} (\sigma_{day=``Monday''}(Classes)))$

For each hour of each day, find the number of courses starting a class at that time

 $\gamma_{day,hour,count(course) \rightarrow numCourses}(Classes)$