

RDBMS and SQL, Aug-Nov 2026

Assignment 1, 17 September 2026, due 27 September 2026

Here are some relations from the university database discussed in class. The column headings are, in general, self-explanatory.

- `instructor(ID,name,dept_name,salary)`
Information about faculty.
 - `department(dept_name,building,budget)`
Information about departments.
 - `course(course_id,title,dept_name,credits)`
Information about courses offered.
 - `student(ID,name,dept_name,total_credits)`
Information about students.
 - `prerequisites(course_id,prereq_id)`
Information about course prerequisites. Both columns refer to `course_id` from the `courses` relation.
 - `section(course_id,sec_id,semester,year,building,room_number,time_slot_id)`
Timetable information — classroom allocation and time slot for courses. `course_id` refers to the `course` relation.
 - `teaches(ID,course_id,sec_id,semester,year)`
Information about course allocation to faculty. `ID` refers to the `instructor` relation and `course_id` refers to the `course` relation.
 - `takes(ID,course_id,sec_id,semester,year,grade)`
Information about course enrollment by students. `ID` refers to the `student` relation and `course_id` refers to the `course` relation.
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Write relational algebra queries for the following using the standard operators— $\{\sigma, \pi, \times, \bowtie, \rho, \cup, \cap, \setminus\}$.

- *You can use the assignment operator to create intermediate relations to set up your solution, but also provide a final solution that only uses renaming.*
 - The queries should be generic. Don't assume that information about the values in the table is known in advance. For instance, in the first two queries, do not assume that the names of the buildings and departments are available to us before we write the query.
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1. Find all departments that share a building with another department.
 2. For each building, identify the department(s) in that building with the highest budget.
 3. Find all faculty members who have taught some course more than once.
 4. Find all faculty members who have taught some course exactly once.
 5. Find all pairs (A, B) such that B is a pre-requisite for A , A has no other pre-requisites and B is not a pre-requisite for any other course.
 6. Find all students who did not register for any course in 2025.
 7. Find all students who have repeated a course.
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How to submit

- For each question, in addition to the relational algebra expression, write a short informal explanation explaining your solution.
 - Submit your solutions on Moodle.
 - Your submission should be a pdf file. It can either be generated using some document writing software, or a scan of a handwritten document.
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