

## Relational Algebra Examples: (Not: SQL sorgularını siz yazın)

Consider the following relations:

Student(ssn, name, address, major)

Course(code, title)

Registered(ssn,code)

1. List the codes of courses in which at least one student is registered (registered courses):

$\pi_{\text{code}} ( \text{Registered} )$

2. List the titles of registered courses (of those in 1.)

$\pi_{\text{code}} ( \text{Course} \bowtie \text{Registered} )$

3. List the codes of courses for which no student is registered

$\pi_{\text{code}} ( \text{Course} ) - \pi_{\text{code}} ( \text{Registered} )$       *Try: Students who are not registered to any courses.*

4. The titles of courses for which no student is registered.

*In the previous query we found the codes; natural join with Course to find the titles.*

$\pi_{\text{name}} ( ( \pi_{\text{code}} ( \text{Course} ) - \pi_{\text{code}} ( \text{Registered} ) ) \bowtie \text{Course} )$

5. Names of students and the titles of courses they registered to.

$\pi_{\text{name,title}} ( \text{Student} \bowtie \text{Registered} \bowtie \text{Course} )$

or, can be written as  $\pi_{\text{name,title}} ( ( \sigma_{1=4 \wedge 5=6} ( \text{Student} \times \text{Registered} \times \text{Course} ) )$

6. SSNs of students who are registered for 'Database Systems' or 'Analysis of Algorithms'.

$\pi_{\text{ssn}} ( \text{Student} \bowtie \text{Registered} \bowtie ( \sigma_{\text{title}='Database Systems'} \text{Course} ) ) \cup$   
 $\pi_{\text{ssn}} ( \text{Student} \bowtie \text{Registered} \bowtie ( \sigma_{\text{title}='Analysis of Algorithms'} \text{Course} ) )$

7. SSNs of students who are registered for both 'Database Systems' and 'Analysis of Algorithms'.

$\pi_{\text{ssn}} ( \text{Student} \bowtie \text{Registered} \bowtie ( \sigma_{\text{title}='Database Systems'} \text{Course} ) ) \cap$   
 $\pi_{\text{ssn}} ( \text{Student} \bowtie \text{Registered} \bowtie ( \sigma_{\text{title}='Analysis of Algorithms'} \text{Course} ) )$

The name of those students:

$A = \pi_{\text{ssn}} ( \text{Student} \bowtie \text{Registered} \bowtie ( \sigma_{\text{title}='Database Systems'} \text{Course} ) ) \cap$   
 $\pi_{\text{ssn}} ( \text{Student} \bowtie \text{Registered} \bowtie ( \sigma_{\text{title}='Analysis of Algorithms'} \text{Course} ) )$   
 $\pi_{\text{name}} ( A \bowtie \text{Student} )$       *used A= instead of  $\rho()$  function.*

8. List of courses in which all students are registered.

$\pi_{\text{code, ssn}} (\text{Registered}) / \pi_{\text{ssn}} (\text{Student})$

SQL: (başka türlü de yazılabilir, önerilerinizi bana email ile yazın)

```
SELECT code FROM Registered
GROUP BY code
HAVING count(*) = (select count(code) from Course)
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9. List of courses in which all 'ECMP' major students are registered.

$\pi_{\text{code, ssn}} (\text{Registered}) / \pi_{\text{ssn}} (\sigma_{\text{major}='ECMP'} \text{Student})$