

Homework 4. Relational algebra:

select, project, cross-product, join – σ π \times \bowtie

For this week, please watch the [introductory RA lecture](#) by Jennifer Widom, and then test your understanding by completing exercises below. You can either type your answers or hand-write them and submit scanned copies.

Submit your answers in file **HW4.pdf**

Each question answered correctly worth 1 point, for a total of 10 points (1% of a course grade)

Part 1. Cartesian product

Perform following relational algebra operations on two relations R(A,B) and S(C,D). Represent the result as relation T.

R	
A	B
3	4
5	6

S	
C	D
4	7
1	6

1. $T = R \times S$

2. $T = \pi_A(R) \times S$

3. $T = \sigma_{A>C}(R \times S)$

Part 2. RA equivalencies

Given 2 relations R(A,B,C) and S(C, D, E) do the following equalities hold?

1. $\pi_A (R \times S) = \pi_A (R) \times S$
2. $\sigma_{A=c' \text{ AND } E=2} (R \times S) = \sigma_{A=c'} (R) \times \sigma_{E=2} (S)$
3. $\pi_A (\sigma_{B=2} (R)) = \sigma_{B=2} (\pi_A (R))$

Part 3. RA queries for movies dataset

Schema:

Movie (title, year, length, inColor, studioName, producer)

MovieStar (name, address, gender, birthdate)

StarsIn (movieTitle, movieYear, starName)

MovieExec (name, address, certN, netWorth)

Studio (name, address, presCertN)

Express the following queries in relational algebra:

1. Find titles of all black-and-white movies which were produced after 1970
2. Find titles of all movies produced by MGM studio after 1970 or with length less than 1.5 hours
3. Find title and length of each Disney movie produced in year 1990
4. Find the names of producers of movies where Harrison Ford starred