
Theory I, Sheet 11

- The solutions should be submitted in English.
- JUST FOR FUN exercises are not mandatory.
- Your solutions should be delivered to the lockbox in building 051 floor 00, or right before the start of the tutorial (July 16, 4:00 p.m.).
- You are allowed to discuss your solutions with each other. Nevertheless, you are required to write down the answers in your own words.

Exercise 11.1 - Relational Algebra

Consider schemata $R(A, B, C, D)$ and $S(C, D)$ with instances r, s as shown below:

$r =$	A	B	C	D
	a	b	c	d
	a	b	e	f
	b	c	e	f
	e	d	c	d
	a	b	e	f
	e	d	e	f
	a	b	d	d

$s =$	C	D
	c	d
	e	f

Compute $r \div s =$

Exercise 11.2 - Relational Algebra and Calculus

Consider schemata $R(A, B)$, $S(B, C)$ and $T(B)$ with instances r, s and t where $t = \pi[B]s$ holds. Give a relational calculus formula for:

$$R \div T \equiv$$

Exercise 11.3 - Relational Algebra and Calculus

JUST FOR FUN. Let $\text{attr}(\alpha)$ compute the set of attributes that occur in a selection condition and let R, S and T be relations with formats X, Y and Z respectively. Prove the equivalences:

1. $\text{attr}(\alpha) \subseteq Y \subseteq X \Rightarrow \pi[Y](\sigma[\alpha]R) \equiv \sigma[\alpha](\pi[Y]R)$
2. $Z \subseteq Y \subseteq X \Rightarrow \pi[Z](\pi[Y]R) \equiv \pi[Z]R$
3. $R \bowtie R \equiv R$