

HOMEWORK 3 (Overview)

Relational algebra is used to let us see what operations in the relational model look like and how we can navigate through data between different relations. It can also be used to identify different kinds of constraints that are useful for restricting database content.

Important notes: A maximum of 8 pages including the P+ assignment.

REQUIRED TASKS (P)

1. If you received feedback to change regarding homework 2, or if you simply want to make adjustments of your own accord, implement these changes, clearly state what has been modified, and explain the reason behind each change.
2. List all your normalised schemas from the previous homework so it is clear what the relational algebra is based on.
3. Write a relational algebra expression for each of the following statements using your own schemas.

For each expression, write an explanation for what is happening in the expression.

- a) A list of Physical IDs of all the books currently being borrowed.
- b) A list of User IDs of all the users that have not borrowed a single book yet.
- c) A list of Physical IDs of all the books that have not been borrowed yet.
- d) A list of User IDs of all users with 4 or more fines.
- e) A list of all user *names* that *returned* the third Harry Potter book between the year 2015 and 2020 (2015 and 2020 included).
- f) A list of Physical_IDs of all the books that have both Horror and Fantasy as genres published before the year 2010.

Important notes:

- It's allowed to use the extended operators of relational algebra found in the course book on chapter 5.2
- Inequality comparisons are allowed for dates.
- Comparisons with NULL are allowed.
- Splitting a long expression into several smaller using assignments is valid.

Note: Grading criteria on the next page

NOTE: 1) Homework **MUST** be handed in via Canvas **only** and in the correct assignment folder, in one file representing the entire homework. 2) Your names, group number must be included in the document. 3) Take into consideration this **exercise is accumulative** and builds upon your solutions. 4) **All homeworks are based solely on the course case study.**

Grading Criteria:

- Is the feedback for homework 2, if such was given, implemented?
- Are all changes in task 1, if such were made, implemented correctly and explained?
- Are all the final schemas from homework 2 included in the list in task 2?
- Are all relational algebra expressions correct?
- Are the relational algebra expressions clear and readable?
- Do all of the relation algebra expressions have a clear and detailed explanation?

HOMEWORK 3 P+ (Constraints)

Important requirement: To be able to pass the P+ assignment, the P assignment has to pass.

TASKS (P+):

1. Explain each of the following constraints and give at least 1 example for each from your database design.
 - a. Referential integrity constraint
 - b. Domain constraint
 - c. Key constraint

Each example must be presented as a relational algebra expression which you must also explain and clarify.

Important notes:

For the example regarding domain constraints, you cannot use that attributes must be atomic or that each attribute only has one data type, since neither of these can be expressed as a relational algebra expression.

Grading Criteria:

- Are the explanations correct and thorough?
- Is at least 1 correct example given per constraint?
- Is each example correctly expressed as a relational algebra expression?
- Is each relational algebra expression explained with words?

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