

Database Systems 1 Summerterm 2023

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Assignment 4

Hand in this assignment until Thursday, 25 May 2023, 12:00 at the latest.

Exam-style Exercises

Exercises marked with (E) are similar in style to those you will find in the exam. You can use these to hone your expectations and gauge your skills.

Running out of ideas?

Are you hitting a roadblock? Are some of the exercises unclear? Do you just need that one hint to get the ball rolling? Refer to the **#forum** channel on our Discord server and check the tag for this assignment—maybe you'll find just the help you need.

Task 1: Types (1 credit)

A deck of French-suited playing cards—commonly referred to as a bridge or poker deck—comprises 52 cards. Each of the four suits C(lubs), D(iamonds), H(earts), and S(pades) features 13 ranks: 2, 3, 4, 5, 6, 7, 8, 9, 10, J(ack), Q(ueen), K(ing) and A(ce). Both suits and ranks are given in ascending significance in a game of poker.

In contrast, a piquet deck—as used for games of skat—only consists of 32 cards comprising the French-suited cards ranked seven through ace. Some games require adding a joker to the deck, increasing the card count to 33. A joker has a rank (denoted as I_0) but no suit.

Note: Hand in everything!

Please add all of your SQL statements—whether or not they result in errors—into a single SQL file and hand it in.

- (a) First we will create two poker decks, CARDS_BAD and CARDS_GOOD. Please follow the steps below and execute your queries on a PostgreSQL database system.
 - i. Construct a CREATE TABLE statement for a table CARDS_BAD with two columns: suit (CHAR(1)) and rank (VARCHAR(2)).
 - ii. Write INSERT statements to fill CARDS_BAD with a complete poker deck (52 rows). Adding multiple rows with a single INSERT statement may come in handy. This *bulk insert* method has been introduced in slide 35 in slide set db1-04.pdf. Check if the data was inserted correctly using the TABLE command.
 - iii. Now, create a second table CARDS_GOOD. This time use CREATE TYPE to create dedicated data types suits and ranks for columns suit and rank that enforce restricted domains dom(suits) and dom(ranks). The domains must allow French-suited playing cards only!
 - iv. Again, insert a complete poker deck into CARDS_GOOD. Think about reusing your created INSERT statements
- (b) Use the DELETE FROM (table) AS t WHERE t.rank < '7' statement to convert the created poker decks in CARDS_BAD and CARDS_GOOD to skat compatible decks (without jokers). Are the resulting tables in both cases as expected? Explain your results.
- (c) Try to **INSERT** a joker into both decks. Do not modify your type definitions! You will encounter difficulties. Please explain your results.

Imagine you want to plan the chore chart of your living community using an *RDBMS*. The chart is expected to provide an assignment of the services TRASH, KITCHEN and BATHROOM to the flatmates *Annika*, *Pierre* and *Leonie* on a weekly basis. The relational model implies that your chart is represented in a tabular form. Figure 1 shows three possible variants of a CHART relation.

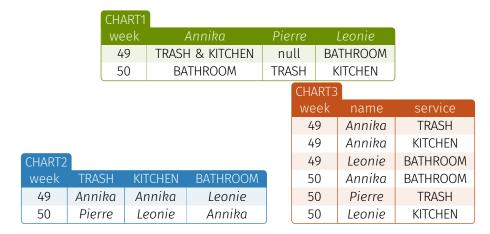


Figure 1: Exemplary possibilities to represent a chore chart in an RDBMS

In this task we will study the properties of these three variants in terms of their *relation schemas* and *relation instances*.

- (a) For each of the CHART relations, write down its *relation schema* and *relation instance*. Use the notation introduced in the lecture (slide 23 and slide 28 in slide set db1-04.pdf).
- (b) Construct **CREATE TABLE** statements for each of the displayed representations. For all columns, choose a data type which is as precise as possible, but puts no constraints on names of new flatmates or services.
- (c) **(E)** Explain what changes to the schema and/or instance are needed for every relation, if we want to:
 - i. add the plan for week 51 (Annika: KITCHEN, Pierre: BATHROOM, Leonie: TRASH)
 - ii. add an additional service COOK for Pierre in week 50
 - iii. switch Leonie with a new flatmate Adrian.

In the relational model, relation schemas are assumed to be stable while instances change frequently. Given this, which relation is the best choice to represent the chore chart?

(d) Specify SQL INSERT, UPDATE and DELETE statements for those relations in subtasks i. to iii. that only need their instance changed.