1. Pairs of people (their card numbers, first names and last names) with the same phone number, with no repetition.

Ex1. If Ben Smith with card number 1 has the same phone number as Keith Smith with card number 2, then the following tuple should be in the result of the query:

[1 | Ben | Smith | 2 | Keith | Smith] (or [2 | Keith | Smith | 1 | Ben | Smith])

Tuple [2 | Keith | Smith | 1 | Ben | Smith] should not appear in the result of the query if the above tuple is in the result, as that would denote repetition of information.

Tuple [1 | Keith | Smith | 1 | Keith | Smith] should not appear in the result of the query as it means that member with card number 1 has the same phone number as member with phone number 1, which is obvious.

Ex2. If Ben Smith with card number 1 and Grace Smith with card number 3 have the same phone number as Keith Smith with card number 2, then the following tuples should be in the result of the query:

[1 | Ben | Smith | 2 | Keith | Smith] (or [2 | Keith | Smith | 1 | Ben | Smith])

[1 | Ben | Smith | 3 | Grace | Smith] (or [3 | Grace | Smith | 1 | Ben | Smith])

[3 | Grace | Smith | 2 | Keith | Smith] (or [2 | Keith | Smith | 3 | Grace | Smith])

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πm1.card\_no, m1.first\_name, m1.last\_name, m2.card\_no, m2.first\_name, m2.last\_name σm1.phone\_no = m2.phone\_no ∧ m1.card\_no < m2.card\_no (ρm1 MEMBER ⨯ ρm2 MEMBER)

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2. Members (their card numbers, first, middle and last names) who hold a book longer than 2 weeks, along with the date they borrowed the book.

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π card\_no, first\_name, middle\_name, last\_name, date\_borrowed ((σ date\_returned = null ∧ adddate(date\_borrowed, 14) < now() BORROW) ⨝ MEMBER)

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3. Members (their card numbers, first, middle and last names) who didn't ever borrow any book.

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π card\_no, first\_name, middle\_name, last\_name ((πcard\_no MEMBER - πcard\_no BORROW) ⨝ MEMBER)

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4. ISBNs and titles of books borrowed on 22/9/3.

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πISBN, title ((σ year(date\_borrowed) = 2022 ∧ month(date\_borrowed) = 9 ∧ day(date\_borrowed) = 3 BORROW) ⨝ COPY ⨝ BOOK)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5. Genres.

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πgenre BOOK

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

6. ISBNs and titles of books that have more than one author.

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πba1.ISBN, title σba1.ISBN = BOOK.ISBN ((σba1.ISBN = ba2.ISBN ∧ ba1.author\_id < ba2.author\_id (ρba1 BOOK\_AUTHOR ⨯ ρba2 BOOK\_AUTHOR)) ⨯ BOOK)

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7. ISBN(s) and title(s) of all books written by Thomas Connolly(s), if any.

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πISBN, title (σfirst\_name = 'Thomas' ∧ last\_name = 'Connolly' (BOOK ⨝ BOOK\_AUTHOR ⨝ AUTHOR))

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8. ISBN(s) and title(s) of all books borrowed by member 331, if any.

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πISBN, title σcard\_no = 331 (BOOK ⨝ COPY ⨝ BORROW)

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9. Member(s) (their card number) who renewed a book twice and still didn't return it, if any.

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σrenewals\_no = 2 ∧ date\_returned = null BORROW

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10. Book(s) (their ISBN(s) and title(s)) with the highest edition.

If there is a book with edition 9th, and no other book has a higher edition in the Libary database, then that book should be returned in the result (it's ISBN and title, to be specific).

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πISBN, title ((πedition BOOK - πb1.edition σb1.edition<b2.edition (ρb1 BOOK ⨯ ρb2 BOOK)) ⨝ BOOK)

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