

## Lab 1 - Normalization exercises

**Exercise 1:** You need to apply the three normal forms for the following exercise:

A library database records the authors and the publisher of each book. Normalize the following relation and indicate the primary and foreign key attribute types:

R (ISBN, title, author (name, date\_of\_birth), publisher (name, address(streetnr, streetname, zipcode, city)), pages, price)

The assumptions are:

- each book has a unique ISBN number;
- each author has a unique name;
- each publisher has a unique name;
- a book can have multiple authors;
- an author can write more than one book;
- a publisher can publish more than one book;
- a book has only one publisher;
- a publisher has only one address.

Suppose that one book can have multiple publishers. How can you extend your model to accommodate this? Where would you put the attribute type “number\_of\_copies”?

**Exercise 2:** Given the following assumptions:

- a flight has a unique flight number, a passenger has a unique name, and a pilot has a unique name;
- a flight is always handled by one airline;
- a flight can have multiple passengers and a passenger can do multiple flights;
- a flight has one pilot and a pilot can do multiple flights;
- a flight is always handled by exactly one airplane.

Normalize the following relation:

Flight (Flightnumber, Flighttime, airline(airlinename), passenger (passengername, gender, date of birth), pilot (pilotname, gender, date of birth), departure\_city, arrival\_city, airplane (planeID, type, seats))