Lesson 5. Complex Data Types
Exercises II – Structures

Exercise 1. Write a program that manages book data in a small library: title, author, ISBN and whether it is currently borrowed or not. The program must: (1) define a structure named `BookRecord` to store book data; (2) declare and initialize to variables with `BookRecord` type; (3) check if the two variables represent the same or different books.

Exercise 2. A screw-manufacturing company needs a program to read, calculate and print several statistical parameters about production samples. Screw data includes the length and the diameter of the head, which must be stored in a structure. Write a program that: (1) reads from the keyboard data corresponding to the screws in the sample; (2) calculates and prints the average length and diameter of the screws in the sample. (The size of the sample must be defined with a constant named SAMPLE_SIZE.)

Exercise 3. A local parcel delivery company needs a program to manage client address data. The company stores information of the city streets (name and list of houses). For each house, the company stores the number and the floor. Write a program that: (1) reads from the keyboard data for each street and house of the city; (2) prints on the screen data of ouses included in a given street (which must be asked to the user). (Assume that there are 5 streets with 5 houses each one.)

Exercise 4. A car-renting company needs a software program to manage client records. Write a program that reads from the keyboard the personal data of 100 customers. Client records include name, surname, phone number and e-mail. Before entering a new customer in the database of the company, the program must check if the customer already exists (use the phone number as unique client identifier). If so, print on the screen the name of the client, the phone number and the position in which this data was stored.

Extend the program to read client records until getting 100 clients or the user decides to stop reading values.

Exercise 5. A music store needs a software program to manage the album catalogue. The catalogue includes several albums. Album data include group data (name, city, and number of members), publishing year, and song data (for each song, title and total length in seconds). Develop a program to read from the keyboard the information of the catalogue.

(NOTE: Use three structures: Album, Group, and Song. Assume that an album includes 15 songs at most, and the size of the catalogue is 5 albums.)

Extend the program to read album data until the maximum size of the catalogue is reached or the user decides to stop reading values.

Extend the program to print on the screen: (a) the title of all the albums released by a given group (the name of the group must be read from the keyboard); (b) the title of all the albums released in a given year (the year must be read from the keyboard.)

Exercise 6. Write a program to manage book data for a bookshop. The shop has 150 books at most. For each book, the shop stores the title, the author, a keyword, publishing year, ranking and theme (1: detectives, 2: historical, 3: computers, 4: social sciences, 5: essay). The program must present a menu with the following options: (1) add new book to the catalogue; (2) print all books in the catalogue; (3) search for the best seller in a given theme; (4) exit.

Exercise 7. Write a program to manage contacts information. For each contact, the program must store the name and the birthday date (day, month, year). The program must: (a) read contact information; (b) read a date (day, month) and print on the screen the name of the contacts whose has this birthday date.