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## Lab 10 - Structures, Union, Enumerations

1. Write a modular program which reads student related data for a group, namely: name, date of birth, residence address, and prints them in alphabetical order according to their name. ★
2. Using the union type containing the structures needed to represent circles, rectangles, squares, and triangles write a function to compute the area of the corresponding geometric figure. ★
3. Write a program to implement the rational data type ( $\mathbb{Q}$ ) as a structure composed of a numerator (integer) and a denominator (integer). Operations that have to be implemented: addition, subtraction, division, multiplication, simplification. ★
4. Write a program to implement the complex data type ( $\mathbb{C}$ ). Operations that have to be implemented: addition, subtraction, division, multiplication. ★★
5. A sparse polynomial is a polynomial that has most of its coefficients equal to 0. Write a program which stores a sparse polynomial of degree  $m$ , displays that polynomial, and finds its value for a given input  $x$ . ★★
6. Using a structure to store a date (year, month, day), write a program to display the number of the day in a year, and the number of days to the end of that year. ★★
7. A sparse matrix is a matrix that has most of its elements equal to 0. Find an effective way to store sparse matrices, and write functions to add, subtract, and multiply pairs of such matrices. ★★★
8. A truck can carry at most  $m$  kilograms. The name of the materials, the amounts in kilograms, and the price per kilo are known. Find a load composition in such a way the value of the load is maximum. ★★★
9. Write a program that implements singly-linked dynamically linked lists. Operations that have to be implemented: node insertion, node deletion, printing the list. ★★★

## References

- Pb. 1-3, 5-9 [1]

[1] Iosif Ignat & Marius Joldos. *CP Laboratory Guide 10: Data Types Structure, Union, Enumerations*.