

Exercise 11

1. Define a structure (`struct`) which has as its members the name, age, address and phone number of a person. Write a program which asks the user for this data, prints it on the screen and writes it to a file.
2. Define a structure which represents a point in a plane. Create an array of points read their coordinates from the file `h11t02.txt` (x -coordinates from the first column and y -coordinates from the second). Write a function which calculates the distance of two points in a plane and use it to calculate the distance of consecutive points in your array.
Hint: Use Pythagoras' theorem for the distance.
3. Define a structure which represents a complex number and write a function which swaps the values of two complex numbers.
4. Define a structure which represents a three-dimensional vector. Its members would be the x , y and z -coordinates of the vector. Using this structure, write functions which carry out the following vector calculations:
 - a) Addition of vectors.
 - b) Scalar times vector.
 - c) Dot product of vectors.
 - d) Cross product of vectors.

Hint: The arguments should be of the structure type you have created. The calculations in a), b) and d) also return a value of this type.

5. Define a structure which represents a 2-by-2 matrix. Write functions which carry out the following matrix calculations:
 - a) Addition of matrices.
 - b) Scalar times matrix.
 - c) Transpose of a matrix.
 - d) Determinant of a matrix:

$$\det A = (A)_{1,1}(A)_{2,2} - (A)_{1,2}(A)_{2,1}.$$

Hint: The determinant of a matrix is a number.