Exercise 6

1. Define the class *Vehicle*. Then define classes *Car* and Boat that derive from the class *Vehicle*. The next class that you need to define is class Amphibious car that derive from class car and boat. Implement two version of the program, the first when class Vehicle is inherited at “standard way”, and the second when class Vehicle is a virtual based class. Demonstrate how defined by you classes can be used, please remember that your program should be equipped with simple user interface. Explain the main differences in both implementations.

2. Define the class Bicycle. Given your knowledge of some common components of bicycle, show a class hierarchy in which the class Bicycle inherits from other classes, which, in turn, inherit from yet other classes. Discuss the instantiation of various objects of class Bicycle. Discuss inheritance from class Bicycle for other closely related derived classes. Write a program that demonstrate proposed by you hierarchy, please remember that your program should be equipped with simple user interface.

3. Vectors with a large number of zeros are called sparse vectors. They are usually stored in a special form: order vector and the vector of values. Order vector indicates that the vector coordinates take the non-zero value in the following way: the occurrence of "1" in the order vector means that the corresponding position of the vector has a value different from zero, while the occurrence of "0" means that the coordinate has a value zero. The vector of values is a vector of nonzero coordinate values of the vector. Write a program that reads the sparse vectors stored in a standardized form, converts it to the form described above and calculates the value of their scalar product. For calculation of scalar product use vectors in the new form. Please remember that your program should be equipped with simple user interface