

## Список 02 – Домашнее Задание

### Массив объектов и указателей на объекты

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*Предмет: Алгоритмизация и программирование*

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**1. Warehouse of Products.** One simple logistic system has as core of this process the definition of warehouses and set of products which will store depending by the Manhattan distance between transport and warehouse. Take as reference the exercise **lab02\_q3**. The entities involved in the process are given by:

#### **A) Warehouse**

- identificatory: string with length of exact 4 characters – initial of W and next 3 are the string representation of autogenerate code initiating from 100. Example: the identificatory need follow the sequence W100, W101, W102.
- type: create a user-defined data type ENUM to define 3 possible categories of warehouse: {center, west, and east};
- longitude: east-west meridian position of warehouse in map (respect Greenwich meridian);
- latitude: north-south parallel position of warehouse in map (respect Equator parallel);
- max capacity: maximum number of products that warehouse can store;
- total stock: current total number of products available in warehouse, calculating adding the quantities of products which come to warehouse;
- list of products: vector of products stored in the warehouse.

#### **B) Product**

- bar code: string automatically generated with length of 13 characters – the first 3 digits identify the country (in this case, Russia: 460), the next 4 digits are random numbers generated (just 9 possible values: 1000, 2000, 3000 ... until 9000) and the last 6 digits are random numbers (any possible random number);
- description: string with max 50 characters, which contains the name of the product;
- price: value of product in rubles;
- quantity: number of samples of product;

- landing positional longitude: coordinate, meridian position from where product should be transported;
- landing positional latitude: coordinate, parallel position from where product should be transported.

Take in account for longitudes, Russia is delimited by 19-169 degrees and in latitudes is delimited by 41-82 degrees. All longitudinal and latitudinal transport and warehouse positions are carried out in Russia.

Realize the next implementations:

[1]. Make an UML diagram, defining the attributes and methods for classes Warehouse and Product.

[2]. Define in class Warehouse: constructors per default, by parameters and by copy of object; and destructors. Warehouse object is a vector of products.

[3]. In class Product, define constructors per default, by parameters, by copy of object, methods setters, getters and method to print product data.

[4]. In class Warehouse, which contains the vector of Products that are store in the warehouse (just exist 3 warehouses: center, west and east), implement a function which calculate the distance between position coordinates of warehouse and the position coordinates of product transportation. The product will store in the warehouse which have the minimum Manhattan distance.

$$d = |latitude_W - latitude_{TP}| + |longitude_W - longitude_{TP}|, \text{ where:}$$

W: warehouse position

TP: transport product position

[5]. Each insertion product in warehouse, it is necessary update the total stock of the warehouse, adding the quantity of product, taking in account the limit of stock. In the process of delete some product from warehouse, it is necessary subtract the quantity of product.

[6]. Implement the next operations for Warehouse class:

- menu
- insert products
- list products in warehouse
- search product by description
- delete products

**2. Class Polynomials.** The polynomial is defined by a sequence of algebraic terms, which contains the coefficient and the variable raised to the exponent. The polynomial is defined by degree of the polynomial.

For example: if degree of the polynomial has degree  $n = 3$ , thus the format of the polynomial is given by:

$$P(x) = a_0 + a_1x + a_2x^2 + a_3x^3, \text{ where is possible define:}$$

A: vector of coefficients  $\rightarrow [a_0, a_1, a_2, a_3]$

E: vector of exponents  $\rightarrow [0, 1, 2, 3]$

x: value of variable

Taking in account the structure of polynomial defined above, make the next implementations:

[1]. Make an UML diagram, defining the attributes and methods for class **Polynomial** and **VectPolynomial**.

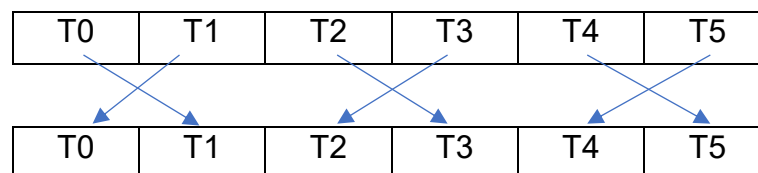
[2]. Develop the constructors by parameters, per default, by object copy and destructor.

[3]. Define functions setters, getters and to print data.

[4]. Implement function to define the polynomial degree. Given this, the user needs for each new term, define the coefficient and exponent.

[5]. For vector of polynomials, implement global procedure to define the number of polynomials which will contains in the vectors.

[6]. The main program need have 2 vectors of polynomials  $V_1$  and  $V_2$  with same size. Take the odds polynomials of  $V_1$  and operate with even polynomials of  $V_2$ . Also, operate the even polynomials of  $V_1$  with odds polynomials of  $V_2$ . Implement function to calculate sum and subtraction between polynomial terms. The result need store in a third vector of polynomials  $V_{out}$ . Check the picture bellow:



[7]. Implement a function to calculate the numerical value of a polynomial. After operation between  $V_1$  and  $V_2$ , print the polynomial expression results of  $V_{out}$  and also calculate the numerical values after replace numerical value of variable x in the polynomials.