Programmieren Aufgaben ab aula05

Aula05
5.1

Respecting the concepts of encapsulation, implement classes that allow you to model the following geometric shapes:
• Circle, characterized by a center and radius;
• Triangle, characterized by the dimension of its sides (side1, side2 and side3);
• Rectangle, characterized by length and height.
Also ensure the following specifications:
a) build the Ponto class;

```
public class Ponto {
   private double x;
   private double y;
   public Ponto(double x, double y) { .. }  // completar
   public getX() { .. }
   public getY() { .. }
   public String toString { .. }
   // ..
}
```

b) create classes that represent each of the geometric figures, implementing suitable constructors and methods for each class.
c) add all the important special methods (toString (), equals (), get ... (), set ... (), ...);
d) implement a method to calculate the area of each type of figure;
e) implement a method to calculate the perimeter of each type of figure;
f) implement a method to verify that the two circles intersect;
g) implement a program that allows you to test all created classes.

5.2

It is intended to build a simplified information system for the management of a university library. The library contains a book catalog and a set of users (students only). All users are identified by their mechanographic number, name and course. The books are characterized by an ID (numeric and sequential, starting at 100), title and type of loan (CONDITIONAL or NORMAL). Start with the following definitions:

```
public class Utilizador {
   private String nome;
   private int nMec;
   private String curso;
```

```
public class Livro {
    private int id;
    private String titulo;
    private String tipoEmprestimo;
```

Make use of access modifiers to ensure that all class attributes are not accessible from the outside. If necessary, define new attributes to meet the requirements of the statement. Test the classes developed with the following program:

```java
import java.util.ArrayList;

public class Ex52 {

   public static void main(String[] args) {

      // Para o conjunto de Livros vamos criar um vetor de 10 posições
      // Este vetor tem uma dimensão fixa pelo que se for necessário guardar
      // mais livros, teremos de criar um vetor de maior dimensão.
      Livro catalogo[] = new Livro[10];
      catalogo[0] = new Livro("Java 8", "CONDICIONAL");
      catalogo[1] = new Livro("POO em Java 8");
      catalogo[2] = new Livro("Java para totós", "NORMAL");
      System.out.println("ID = " + catalogo[1].getId() + ", "
                           + catalogo[1].getTitulo());
      catalogo[2].setTipoEmprestimo("CONDICIONAL");

      for (int i = 0; i < catalogo.length; i++) { // usando o indice do vector
         if (catalogo[i] != null) // porque o vector catalogo não está cheio
            System.out.println(catalogo[i]);
      }

      // Para o conjunto de utilizadores usamos a classe java.util.ArrayList
      // É uma implementação de um vetor com tamanho variável
      ArrayList<Utilizador> alunos = new ArrayList<>();
      alunos.add(new Utilizador("Catarina Marques", 80232, "MIEGI"));
      alunos.add(new Utilizador("Joao Silva", 90123, "LEI"));
      alunos.get(1).setnMec(80123);

      for (Utilizador u : alunos) { // usando foreach
            System.out.println(u);
      }
   }
}
```

Whose result of its execution must be:

```
ID = 101, POO em Java 8
Livro 100; Java 8; CONDICIONAL
Livro 101; POO em Java 8; NORMAL
Livro 102; Java para totós; CONDICIONAL
Aluno: 80232; Catarina Marques; MIEGI
Aluno: 80123; Joao Silva; LEI
```

5.3

Using the classes developed in the previous exercise, implement a program that allows you to manage users and loans in a library. Start by building, in an interactive way, the following menu:

1 - enroll user
2 - remove user
3 - print user list
4 - register a new book
5 - print book list
6 - borrow
7 - return
8 - leave

Additional conditions:

a) It is recommended that loan and return operations be carried out based on the ID of the book and the student's mechanographic number.

b) Each student can only request a maximum of 3 books simultaneously. You must modify the user class to be able to save the IDs of the requested books, as well as the book class to indicate their availability.

c) For simplicity, consider that there is only one copy of each book and that books with a CONDITIONAL loan type cannot be requested.

d) To store the book catalog and the list of students, use vectors, considering that at most the library can have 100 books and 100 users.