Programiranje 1 — Homework assignment 8

Deadline: Sunday, January 6, 2019, at 23:55

Syllabus

Introduction

The set of courses that a student has to pass constitutes his/her *syllabus*. Every course is described by an ID, a name, the number of credit points, type (compulsory, elective, or modular), the module it belongs to (if the course is modular), and a list of teachers teaching the course. A module is defined by an ID and a name. A teacher is defined by an ID and a name and surname. All IDs are integers from the interval $[1, 10^5 - 1]$. A pair of objects of the same type (i.e., two courses, two modules, or two teachers) can never have the same ID.

Courses, modules, teachers, and syllabi[1] are represented as objects of the classes `Predmet`, `Modul`, `Izvajalec`, and `Predmetnik`, respectively. All four classes are defined as static inner classes in the file `Naloga.java` in the directory `javniTesti`:[2]

```
public class Naloga {

    public static class Predmet {       // a course
        private int sifra;              // ID
        private String naziv;           // name
        private int kt;                 // the number of credit points
        private int tip;                // type (0: compulsory; 1: elective; 2: modular)
        private Modul modul;            // reference to the module the course belongs to
                                        //       (null if the course is not modular)
        private Izvajalec[] izvajalci;  // the teachers teaching the course
    }

    public static class Modul {   // a module
        private int sifra;        // ID
        private String naziv;     // name
    }

    public static class Izvajalec {  // a teacher
        private int sifra;           // ID
        private String ip;           // name and surname
    }

    public static class Predmetnik {   // a syllabus
        private Predmet[] predmeti;    // the courses that constitute the syllabus
    }
}
```

[1] Plural of *syllabus*.

[2] Static inner classes behave in the same way as independent classes. However, when we access them from within another file, we have to prepend their name with the name of the outer class (e.g., `Naloga.Predmet` instead of `Predmet`).

Task description

Complete the class `Predmetnik` with the following methods (within the square brackets, we specify the test cases in which the given method is called):

- `public int steviloKT()` [J1–J2, S1–S9]

  Returns the total number of credit points for the courses in `this` syllabus.

- `public int[] tipiPredmetov()` [J3–J4, S10-S17]

  Returns a three-element array, with the first element containing the number of compulsory courses, the second containing the number of elective courses, and the third containing the number of modular courses in `this` syllabus.

- `public Predmet predmetZNajvecIzvajalci()` [J5–J6, S18-S25]

  Returns a reference to the course in `this` syllabus that has the greatest number of teachers. If there are several such courses, the method should select the one with the lowest ID. If the syllabus contains no courses, the method should return `null`.

- `public int predmetiModula(int sifra, String[] nazivi)` [J7–J8, S26–S34]

  Writes the names of all courses in `this` syllabus that belong to the module with ID `sifra` into the array `nazivi`. The name of the first such course has to be written into the element with index 0, the name of the second goes into the element with index 1, etc. The method returns the number of courses written into the array `nazivi`.

  You may assume that the array `nazivi` is large enough to accommodate all courses of the given module. The names may be written into the array in any order.

- `public int steviloIzvajalcev()` [J9–J10, S35–S42]

  Returns the total number of teachers teaching the courses in `this` syllabus. Every teacher should be counted only once, even if (s)he teaches multiple courses.

- `public int steviloEnakoMocnihModulov(Predmetnik drugi)` [J11–J12, S43–S50]

  Returns the number of modules that occur in both `this` syllabus and the syllabus `drugi` and are made up of the same number of courses in both syllabi. Keep in mind that a module is uniquely determined by its ID.

Example

Let us show the file `TestZbrano.java`, in which the method calls from the files `Test01.java`, `Test03.java`, `Test05.java`, `Test07.java`, `Test09.java`, and `Test11.java` are put together:

```java
import java.util.Arrays;

public class TestZbrano {

    public static void main(String[] args) {
        Naloga.Modul[] moduli = {
            new Naloga.Modul(2345, "Programska oprema"),
            new Naloga.Modul(7654, "Strojna oprema"),
            new Naloga.Modul(1357, "Informatika")
        };
        Naloga.Izvajalec[] izvajalci = {
            new Naloga.Izvajalec(725, "Ana Arko"),
            new Naloga.Izvajalec(318, "Boris Bergant"),
            new Naloga.Izvajalec(944, "Cvetka Cevc"),
            new Naloga.Izvajalec( 56, "Denis Dolenc"),
            new Naloga.Izvajalec(801, "Eva Erlah"),
            new Naloga.Izvajalec( 39, "Franci Frece"),
            new Naloga.Izvajalec(490, "Gabrijela Govekar"),
            new Naloga.Izvajalec(623, "Hinko Holc")
        };

        Naloga.Predmet[] vsiPredmeti = {
            new Naloga.Predmet(79805, "Analiza", 6, 0, null,
                    new Naloga.Izvajalec[]{izvajalci[2], izvajalci[6]}),

            new Naloga.Predmet(94023, "Digitalna obdelava signalov", 8, 2, moduli[1],
                    new Naloga.Izvajalec[]{izvajalci[1]}),

            new Naloga.Predmet(61932, "Diskretne strukture", 6, 0, null,
                    new Naloga.Izvajalec[]{izvajalci[2], izvajalci[4]}),

            new Naloga.Predmet(24860, "Informacijski sistemi", 5, 2, moduli[2],
                    new Naloga.Izvajalec[]{izvajalci[3], izvajalci[6], izvajalci[7]}),

            new Naloga.Predmet(13470, "Operacijski sistemi", 9, 2, moduli[0],
                    new Naloga.Izvajalec[]{izvajalci[4]}),

            new Naloga.Predmet(39815, "Osnove ekonomije", 4, 1, null,
                    new Naloga.Izvajalec[]{izvajalci[0]}),

            new Naloga.Predmet(33426, "Podatkovne baze", 7, 2, moduli[2],
                    new Naloga.Izvajalec[]{izvajalci[6]}),

            new Naloga.Predmet(52131, "Prevajalniki", 6, 2, moduli[0],
                    new Naloga.Izvajalec[]{izvajalci[1], izvajalci[4]}),

            new Naloga.Predmet(40036, "Umetna inteligenca", 7, 2, moduli[0],
                    new Naloga.Izvajalec[]{izvajalci[5], izvajalci[7]}),

            new Naloga.Predmet(85193, "Vhodno-izhodne naprave", 4, 2, moduli[1],
                    new Naloga.Izvajalec[]{izvajalci[5], izvajalci[6]})
        };

        Naloga.Predmet[] izborPredmetov = {
            vsiPredmeti[0], vsiPredmeti[1], vsiPredmeti[2],
            vsiPredmeti[4], vsiPredmeti[7], vsiPredmeti[9]
        };

        Naloga.Predmetnik predmetnik = new Naloga.Predmetnik(izborPredmetov);

        System.out.println(predmetnik.steviloKT());

        System.out.println(Arrays.toString(predmetnik.tipiPredmetov()));

        System.out.println(predmetnik.predmetZNajvecIzvajalci().toString());

        String[] nazivi = new String[izborPredmetov.length];
        int stPredmetov = predmetnik.predmetiModula(2345, nazivi);
        String[] nazivi1 = Arrays.copyOf(nazivi, stPredmetov);
        Arrays.sort(nazivi1);
        System.out.println(Arrays.toString(nazivi1));

        System.out.println(predmetnik.steviloIzvajalcev());

        Naloga.Predmetnik popoln = new Naloga.Predmetnik(vsiPredmeti);
        System.out.println(predmetnik.steviloEnakoMocnihModulov(popoln));
    }
}
```

The file `izhodZbrano.txt` contains the corresponding output:

```
39
[2, 0, 4]
52131 (Prevajalniki)
[Operacijski sistemi, Prevajalniki]
5
1
```

The courses in the syllabus `predmetnik` have 39 credit points in total. The syllabus comprises 2 compulsory, 0 elective, and 4 modular courses. Among the courses with the greatest number of teachers (Analiza, Diskretne strukture, Prevajalniki, and Vhodno-izhodne naprave), the course Prevajalniki has the lowest ID. The module Programska oprema consists of the courses Operacijski sistemi and Prevajalniki. The total number of course teachers in the syllabus is equal to 5 (Boris, Cvetka, Eva, Franci, and Gabrijela). Only one module (Strojna oprema) occurs in both the syllabus `predmetnik` and the syllabus `popoln` and, simultaneously, comprises the equal number of courses in both syllabi.

Remark

You may add auxiliary methods to the file `Naloga.java`, but don't add, modify, or remove attributes.

Submission

Submit the updated file `Naloga.java`. In the first line of the file, specify your student ID number within a comment.