**Programming Languages / Java (BSc), 3rd lab**

**Task 1**

Create a class Foo in the package packagename. The class should contain a field and a method. The package should also contain a Main program, which instantiates Foo and calls its method.

Create another Main class in package otherpackage. This should also instantiate the Foo class defined in package packagename.

package packagename;

public class Foo {

public int var;

public void method() {

System.out.println("The value of var = " + var);

}

}

package packagename;

class Main {

public static void main(String[] args) {

Foo f = new Foo();

f.var = 10;

f.method();

}

}

package otherpackage;

import packagename.Foo;

class Main {

public static void main(String[] args) {

packagename.Foo f = new packagename.Foo();

f.var = 23;

f.method();

}

}

**Task 2**

Reorganize the code of class Point and the corresponding main program as produced in the previous lab. In the reorganized code, those classes should go to the point2d package. Ensure that the Point class is not visible from outside of its package. The Point class and the main program should be written as two compilation units.

package point2d;

class Main {

public static void main(String[] args) {

Point p = new Point();

p.x = 1;

p.y = 2;

p.move(3, 5);

System.out.println("p x = " + p.x + ", y = " + p.y);

Point p2 = new Point();

p2.x = 4;

p2.y = -1;

p.mirror(p2);

System.out.println("p x = " + p.x + ", y = " + p.y);

System.out.println("distance = " + p.distance(p2));

}

}

package point2d;

class Point {

public double x, y;

public void move(double dx, double dy) {

x += dx;

y += dy;

}

public void mirror(double cx, double cy) {

x = 2 \* cx - x;

y = 2 \* cy - y;

}

public void mirror(Point that) {

x = 2 \* that.x - x;

y = 2 \* that.y - y;

}

public double distance(Point that) {

double dx = x - that.x;

double dy = y - that.y;

return Math.sqrt(dx\*dx + dy\*dy);

}

}

**Task 3**

Change the code produced in Task 2 in a way that the main program goes into different package, pointm.

package pointm;

import point2d.Point;

class Main {

public static void main(String[] args) {

Point p = new Point();

p.x = 1;

p.y = 2;

p.move(3, 5);

System.out.println("p x = " + p.x + ", y = " + p.y);

Point p2 = new Point();

p2.x = 4;

p2.y = -1;

p.mirror(p2);

System.out.println("p x = " + p.x + ", y = " + p.y);

System.out.println("distance = " + p.distance(p2));

}

}

**Task 4**

Create a package circle and its sub-package utils. Class Point should now be put into this circle.utils package. Create the circle.Circle class, which stores the radius of the circle (double) and the center of the circle (class circle.utils.Point). Create a main program as class circle.Main.

package circle.utils;

public class Point {

public double x, y;

public void move(double dx, double dy) {

x += dx;

y += dy;

}

public void mirror(double cx, double cy) {

x = 2 \* cx - x;

y = 2 \* cy - y;

}

public void mirror(Point that) {

x = 2 \* that.x - x;

y = 2 \* that.y - y;

}

public double distance(Point that) {

double dx = x - that.x;

double dy = y - that.y;

return Math.sqrt(dx\*dx + dy\*dy);

}

}

package circle;

public class Circle {

public circle.utils.Point center;

public double radius;

public void enlarge(double f) {

radius \*= f;

}

public double getArea() {

return Math.PI \* radius \* radius;

}

public String toString() {

return "(" + center.x + "," + center.y + "), r = " + radius;

}

}

package circle;

public class Main {

public static void main(String[] args) {

Circle c1 = new Circle();

c1.center = new circle.utils.Point(); // ez Ă­gy nyeh -> kell konstruktor

c1.center.x = 3;

c1.center.y = 5;

c1.radius = 10;

System.out.println(c1);

c1.enlarge(3);

System.out.println(c1);

}

}

**Task 5**

Modify the code for Task 4 in such a way that the fields in the classes Point and Circle are not visible from outside of the containing classes. The access to the fields should be provided by constructors and getter/setter methods.

package circle;

import circle.utils.Point;

public class Circle {

private Point center;

private double radius;

public Circle(Point center, double radius) {

this.center = center;

this.radius = radius;

}

public Circle(double x, double y, double radius) {

this.center = new circle.utils.Point(x, y);

this.radius = radius;

}

public void enlarge(double f) {

radius \*= f;

}

public double getArea() {

return Math.PI \* radius \* radius;

}

public double getRadius() {

return radius;

}

public String toString() {

return "(" + center.getX() + "," + center.getY() + "), r = " + radius;

}

}

package circle.utils;

public class Point {

private double x, y;

public Point(double x, double y) {

this.x = x;

this.y = y;

}

public Point(Point that) {

this.x = that.x;

this.y = that.y;

}

public double getX() {

return x;

}

public double getY() {

return y;

}

public void move(double dx, double dy) {

x += dx;

y += dy;

}

public void mirror(double cx, double cy) {

x = 2 \* cx - x;

y = 2 \* cy - y;

}

public void mirror(Point that) {

x = 2 \* that.x - x;

y = 2 \* that.y - y;

}

public double distance(Point that) {

double dx = x - that.x;

double dy = y - that.y;

return Math.sqrt(dx\*dx + dy\*dy);

}

}

package circle;

import circle.utils.Point;

public class Main {

public static void main(String[] args) {

Point center = new Point(3, 5);

Circle c1 = new Circle(center, 10);

System.out.println(c1);

c1.enlarge(3);

System.out.println(c1);

c1.enlarge(2);

System.out.println("circle's radius is " + c1.getRadius());

}

}

**Task 6**

Create a class stringutils.IterLetter. Its constructor expects a String reference. (Make sure that your code handles the case when this reference is null.) Create a method printNext() in this class, which prints the next unprinted letter of the initializing string in a new line on the standard output. (The first call of the method prints the first letter, the second call prints the second letter, and so on).

After all the letters of the string have been printed, the printNext() method should not print anything anymore.

The class should have a restart() method, which can be used to re-initiate the printing functionality. After restart(), the stringutils.IterLetter object should print the first letter of the initializing string for the following printNext() method.

Finally, add a hasNext() method, which returns true if (and only if) there are letters to be printed in the string.

Create a main program in Main in the anonymous package. The main program should instantiate class stringutils.IterLetter, and illustrates its use.

package stringutils;

public class IterLetter {

private String str;

private int counter;

public IterLetter(String str) {

if (str == null) {

throw new IllegalArgumentException("Invalid string");

}

this.str = str;

this.counter = 0;

}

public void restart() {

counter = 0;

}

public boolean hasNext() {

return counter < str.length();

}

public void printNext() {

if (hasNext()) {

System.out.println(str.charAt(counter++));

}

}

}

import stringutils.IterLetter;

public class Main {

public static void main(String[] args) {

IterLetter it = new IterLetter("hello");

it.printNext();

it.printNext();

it.restart();

while (it.hasNext()) {

it.printNext();

}

}

}

**Task 7**

Create an enumeration type Gender containing the two values Gender.MALE and Gender.FEMALE. Create class Person to hold personal data: surname, given name (both String), occupation (String), gender (Gender) and year of birth (int).

The class should have a constructor accepting initialization values for all the attributes.

Create a method toString() in the class, with return type String. This method converts personal data to a formatted string.

Create an equals(Person that) method as well, which returns true if (and only if) the current person has the same personal data as the "Person that", passed as parameter. Be careful with a possibly null parameter. For such a parameter the method should return false.

The Person class and the Gender type should be in package person. Create a main program in package main. The main program should create two person objects, and checks whether they are the "same". The result of the comparison and the two objects should be printed on the standard output.

package person;

public enum Gender {

MALE, FEMALE

}

package person;

public class Person{

private String lname;

private String fname;

private String occupation;

private Gender gender;

private int birthYear;

public Person(String lname, String fname, String occupation, Gender gender, int birthYear) {

this.lname = lname;

this.fname = fname;

this.occupation = occupation;

this.gender = gender;

this.birthYear = birthYear;

}

public boolean equals(Person p) {

return (p != null) && (p.lname.equals(lname)) && (p.fname.equals(fname)) && (p.occupation.equals(occupation)) && (p.gender == gender) && (p.birthYear == birthYear);

}

public String toString() {

return fname +" "+ lname +" "+ occupation +" "+ gender +" "+ birthYear;

}

}

package main;

//import person.\*;

import person.Gender;

import person.Person;

public class PersonTest {

public static void main(String[] args) {

Person a = new Person("Smith", "Joe", "doctor", Gender.MALE, 1945);

Person b = new Person("Taylor", "Ann", "hairdresser", Gender.FEMALE, 1964);

System.out.println(a);

System.out.println(b);

if (a.equals(b)) {

System.out.println("Same person");

} else {

System.out.println("Not the same person");

}

}

}

**Some related links:**

1. **Constructors:**

[**https://www.javatpoint.com/java-constructor**](https://www.javatpoint.com/java-constructor)

1. **this keyword:**

[**https://www.javatpoint.com/this-keyword**](https://www.javatpoint.com/this-keyword)

1. **Java Packages:**

**https://www.javatpoint.com/package**

1. **Java enumeration:**

**https://beginnersbook.com/2014/09/java-enum-examples/**

1. **Getter & setter (Encapsulation)**

**https://www.javatpoint.com/encapsulation**

1. **charAt()**

**https://www.w3schools.com/java/ref\_string\_charat.asp#:~:text=The%20charAt()%20method%20returns,is%201%2C%20and%20so%20on.**