Prof. Dr. A. Poetzsch-Heffter
Dipl.-Inform. Kathrin Geilmann

University of Kaiserslautern
Department of Computer Science
Software Technology Group

Advanced Aspects of Object-Oriented Programming (SS 2011)

Practice Sheet 5

Date of Issue: 10.05.11
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(until 10 a.m. as PDF via E-Mail)

Exercise 1 Questions

a) Add one or more questions to the document at `http://bit.ly/lGbs2v`.

Exercise 2 *StoJas* Extension (postponed from Sheet 4)

In this exercise, we are going to build extensions to the Java subset *StoJas* that was presented in the lecture.

a) Extend the syntax as well as the semantics (static & dynamic) of *StoJas* to support a "**for** (...) { ... }" statement and give a detailed explanation for the necessary adjustments.

b) Extend the syntax as well as the semantics (static & dynamic) of *StooJas* to support static methods and give a detailed explanation for the necessary adjustments.

c) Extend the syntax as well as the semantics (static & dynamic) of *StooJas* to support static variables and give a detailed explanation for the necessary adjustments.

Exercise 3 Covariance & Contravariance

a) Discuss the concept of Java's *Checked Exceptions* with respect to covariance and contravariance.

b) Which kind of guarantee is given by *Checked Exceptions*?

Exercise 4 Generics

a) Write a generic static method flip which takes an object of class Pair (see the slides of the lecture) and flips the elements of the *given* Pair object. *Hint: In order to flip the elements, both need to be of the same type.*

b) Write a method equals which only allows to compare two objects using the compareTo Method of the Comparable interface.

c) What is the difference between a Collection<?> and a Collection<Object> ?

d) Explain the output of the following program:

```
public final class GenericClass<T> {
   public void overloadedMethod(Collection<?> o) {
        System.out.println("overloadedMethod (Collection<?>)");
    }
    public void overloadedMethod(List<Number> s) {
        System.out.println("overloadedMethod (List<Number>)");
    }
    public void overloadedMethod(ArrayList<Integer> i) {
        System.out.println("overloadedMethod (ArrayList<Integer>)");
    }

    private void method(List<T> t) {
        overloadedMethod(t); // which method is called?
    }

    public static void main(String[] args) {
        GenericClass <Integer> test = new GenericClass<Integer>();
        test.method(new ArrayList<Integer>());
    }
}
```

e) The interface `Collection<T>` contains a generic method to convert a collection into an array. The method has the signature `<T> T[] toArray(T[] a)`.

What is the purpose of the parameter `a`? Is it possible to write a method with the same behavior with the signature `<T> T[] toArray()`? Justify your answer.