Hochschule Landshut SS 2024
Concepts of Modern Programming Languages

Assigned: May 16th, 2024
Due: no later than June 13th, in the lab

Programming Assignment 3: Java Generics

As a warmup for this lab, read Gilad Bracha's paper on Java Generics (In Moodle "Generics Paper").

Then, work out the following problems:

1. Write a generic method to count the number of elements in a collection that have a specific property (for example, odd integers, prime numbers, palindromes).

2. Will the following class compile? If not, why?

```
 public final class Algorithm {
  public static <T> T max(T x, T y) {
      return x > y ? x : y;
  }
}
```

3. Write a generic method to exchange the positions of two different elements in an array.

4. What is the following class converted to after type erasure?

```
 public class Pair<K, V> {

  public Pair(K key, V value) {
      this.key = key;
      this.value = value;
  }

  public K getKey(); { return key; }
  public V getValue(); { return value; }

  public void setKey(K key)     { this.key = key; }
  public void setValue(V value) { this.value = value; }

  private K key;
  private V value;
}
```

5. Will the following method compile? If not, why?

```
public static void print(List<? extends Number> list) {
    for (Number n : list)
        System.out.print(n + " ");
    System.out.println();
}
```

6. Write a generic method to find the maximal element in the range `[begin, end)` of a list.

7. Will the following class compile? If not, why?

```
public class Singleton<T> {

    public static T getInstance() {
        if (instance == null)
            instance = new Singleton<T>();

        return instance;
    }

    private static T instance = null;
}
```