



J. Hoenicke
A. Nutz

26.04.2017

Please hand in your solution until the
beginning of the lecture on 03.05.2017, on
paper or via email to
nutz@informatik.uni-freiburg.de.

Tutorials for “Formal methods for Java” Exercise sheet 1

Exercise 1: Java Semantics

Consider the following Java program:

```
class Test {  
    public static void main(String[] args) {  
        Number[] a = new Byte[3];  
        a[0] = new Integer(1);  
    }  
}
```

What goes wrong? Explain using the Java Language Specification.

Exercise 2: JML Installation

Download and install (extract) the latest release of OpenJML from <https://github.com/OpenJML/OpenJML/releases/>.

Exercise 3: JML Specifications

Consider the following Java method:

```
static int f(int n){  
    int i = 0;  
    int s = 1;  
  
    while (s < n) {  
        i = i + 1;  
        s = s + 2 * i + 1;  
    }  
  
    return i;  
}
```

Write a JML specification for method `f` that precisely characterizes the method's return value for non-negative input values `n`. Test your specification with the JML runtime checker. You might need a `main` method that calls `f` with various inputs.

Remember: You have to “JML compile” your file using

```
java -jar <openjml folder>/openjml.jar -rac <.java file>.
```

Then you can execute it normally with `java <main class name>`. Note that the file `<openjml folder>/jmlruntime.jar` must be in your Java classpath (via environment variable `CLASSPATH` or through the `-classpath` option of the `java`-command).