Iterator & for cycle

• for (Object o : foo)
  – can be used if foo is an array or foo can be iterated
  – how to achieve it?
    • implement the java.lang.Iterable interface
• Iterable has a single method
  java.util.Iterator iterator()

• methods of the Iterator interface
  – boolean hasNext()
  – Object next()
  – void remove()

• the iterator typically implemented as an anonymous inner class

• in reality, the Iterator is generic, i.e. Iterator<T>
  – we will ignore it for now
public class MyArrayWithIterator implements Iterable {
    private Object[] arr = new Object [5];
    private int s = 0;

    public int size() {
        return s;
    }

    public void add(Object o) {
        ... 
        arr[s++] = o;
        ...
    }

    public Iterator iterator() {
        return new Iterator() {
            private int index = 0;
            public boolean hasNext() {
                return index < s;
            }
            public Object next() {
                return arr[index++];
            }
            public void remove() {
                throw new UnsupportedOperationException();
            }
        };
    }

    • since Java 8, remove() is **default**
    • the implementation throws this exception
Assignment 1

• create the interface MyCollection with methods
  – void add(Object o)
  – Object get(int i)
  – void remove(Object o)
  – void remove(int i)
  – int size()

• create an implementation of MyCollection
  – use an array, which is reallocated if needed
  – handle all error states by exceptions
    • access out of bounds of the array

• add the iterator (see previous slides)
Assignment 2

• create a class representing a balanced binary search tree (e.g., AVL, RB, or any other)
  – for the int type
• add the iterator that iterates the tree from the smallest element till biggest one
• create a program, which uses the tree and loads data from arguments of the command-line
  – use Integer.parseInt(String s) to transform String into int
    • do not forget to handle exceptions the method throws in a case, the string cannot be transformed

• think how to update the tree in order it can be defined with the Object type
  – i.e. how to achieve that tree elements are comparable
  – implement it
Tests...
Test 1

• What is printed out – true or false

```java
public class Test01 {
    public static void main(String[] argv) {
        System.out.println(test());
    }

    public static boolean test() {
        try {
            return true;
        } finally {
            return false;
        }
    }
}
```

The example based on code from J. Bloch, N. Gafter: Java Puzzlers
Test 2

• What is printed out?

```java
public class Test02 {

    public static void main(String[] argv) {
        try {
            System.out.println("Hello world!");
            System.exit(0);
        } finally {
            System.out.println("Goodbye");
        }
    }
}
```

The example based on code from J. Bloch, N. Gafter: Java Puzzlers
Test 3

• What is printed out

```java
public class ParamsTest {
    public ParamsTest(Object o) {
        System.out.println("ParamsTest(Object o)");
    }
    public ParamsTest(long[] a) {
        System.out.println("ParamsTest(long[] a)");
    }
    public static void main(String[] argv) {
        new ParamsTest(null);
    }
}
```

• A cannot be compiled
• B ParamsTest(Object o)
• C ParamsTest(long[] a)
Test 3

- C is correct answer

- Why?
  - Searching a method/constructor
    - based on the actual parameters, all the methods/constructors that can be used, are selected
    - from the selected methods/constructors, the most specific one is selected based on the formal parameters
  - ParamsTest(long[] a) is more specific than ParamTest(Object o)
    - everything, that can assigned to long[] a can be also assigned to Object
    - but it is not true vice-versa
Test 4

• What is printed out
  class A {
      public static void foo() {
          System.out.println("foo");
      }
  }
  class B extends A {
      public static void foo() {
          System.out.println("bar");
      }
  }
  public class OverloadTest {
      public static void main(String[] argv) {
          A a = new A();
          A b = new B();
          a.foo();
          b.foo();
      }
  }

  ● A foo bar
  ● B foo foo
  ● C bar bar
  ● D something else
Test 4

- B is correct
- static methods are not virtual