Exercise 2

1. What is the name of the root class in the class hierarchy?

2. Is there multiple inheritance in Java?

3. What is the difference between classes and interfaces?

4. What is the difference between `int` and `Integer`?

5. What is the difference between overriding and overloading? Which one corresponds to redefine in Eiffel?

6. What is exception handling?

7. Is a `String` array a subtype of an `Object` array? Do you need any dynamic checks? What about Eiffel? Write down an example program in Java that illustrates the behavior.

8. What is the Java Virtual Machine (JVM) and for what is it used?

9. Can the following Java program be compiled? Does it throw a runtime error? Why?

```
interface I1 {}
interface I2 {}
final class C1 implements I1 {}

public class Ex1 {
    public static void main( String[] args ) {
        C1 c1 = new C1();
        I2 i2 = (I2) c1;
    }
}
```

10. Can the following Java program be compiled? Does it throw a runtime error? Why?

```
interface I1 {}
interface I2 {}
class C1 implements I1 {}
final class C2 extends C1 {}

public class Ex2 {
    public static void main( String[] args ) {
        C1 c1 = new C2();
        I2 i2 = (I2) c1;
    }
}
```

11. Can the following Java program be compiled? Does it throw a runtime error? What output is generated? What is overwritten? What methods are overloaded? How many attributes does a C2 object store?

```
class C1 {
    int age = 99;
    int getAge() { return age; }
}
class C2 extends C1 {
    int age = 22;
    int getAge() { return age; }
}

public class Ex3 {
    public static void main( String[] args ) {
        C1 c1 = new C1();
        C2 c2 = new C2();

        System.out.println("C1.age: " + c1.age);
        System.out.println("C1.getAge: " + c1.getAge());

        System.out.println("C2.age: " + c2.age);
        System.out.println("C2.getAge: " + c2.getAge());

        c1 = c2;
        System.out.println("C1=C2.age: " + c1.age);
        System.out.println("C1=C2.getAge: " + c1.getAge());
    }
}
```