

Objects and Types

- Exercises are given every week on the PL page of the SCG website (<http://scg.unibe.ch/teaching/pl>)
- Solutions to each assignment must be sent to **mohammadreza.hazhirpasand@inf.unibe.ch**
- The solutions of the assignments are to be delivered before every Thursday at 11 PM. Solutions handed in later than the specified time will not be accepted. In case of serious reasons send an e-mail to **mohammadreza.hazhirpasand@inf.unibe.ch**

Exercise (6 points)

1. What is the difference between subtyping and subclassing? Provide an example for your explanation. (1.5 pts)
2. Using the Java class-interface hierarchy given in [Figure 1](#), explain what is the relationship between classes and interfaces. (1.5 pts)

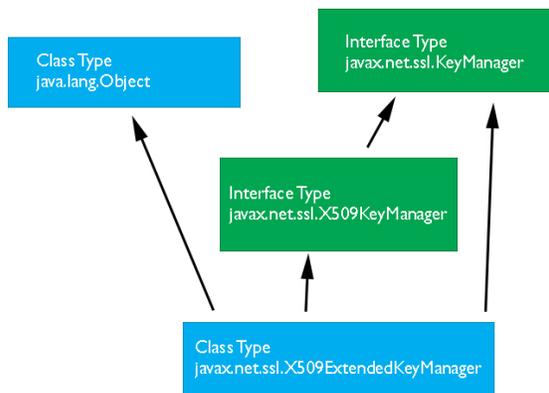


Figure 1: Java interface hierarchy

3. Which forms of polymorphism are used in the Java code in [Listing 1](#)? Explain each of the forms. (1.5 pts)
4. In the Java code [Listing 2](#), explain what concept (covariance or contravariance) exists and why. (1.5 pts)

```
public class Bern<TT> { // Hint 2
    private TT var1;
    public void set(TT mh) { this.var1 = mh; }
    public TT get() { return var1; }

    public static void main(String[] args) {
        int a = 3;
        float b = 2F;
        b = a; // Hint 1
        System.out.println(b);
        Bern<Integer> mj = new Bern();
        mj.set(12);
        System.out.println(mj.get());
    }
}
```

Listing 1: Forms of polymorphism

```
Double[] mh = new Double[2];
mh[0] = 100.2;
mh[1] = 200.2;

Number[] nm = mh;

nm[0] = 1000.5;

System.out.println(nm[0]);
```

Listing 2: Forms of polymorphism