Lecture 7

Encapsulation

Access modifiers

Keyword *final*

Static fields and methods

Packages

Packages in java:

- Hierarchical units identical to folders – on the file system the packages are presented as folders
- Provide grouping of related types(classes)
- Provide access protection and space management

```
package lesson06;

public class Car {
        String model;
        double price;
        boolean isSportCar;
        double maxSpeed;
}
```

Encapsulation

Encapsulation:

- One of the four fundamental OOP concepts
- The ability of an object to be a container (or capsule) for related properties (fields) and behaviours (methods).
- A protective barrier that prevents the code and data being randomly accessed by other code defined outside the class.
- Benefits:
- Main benefit is the ability to use the implemented code without breaking its logic and constraints
- It gives maintainability, flexibility and extensibility

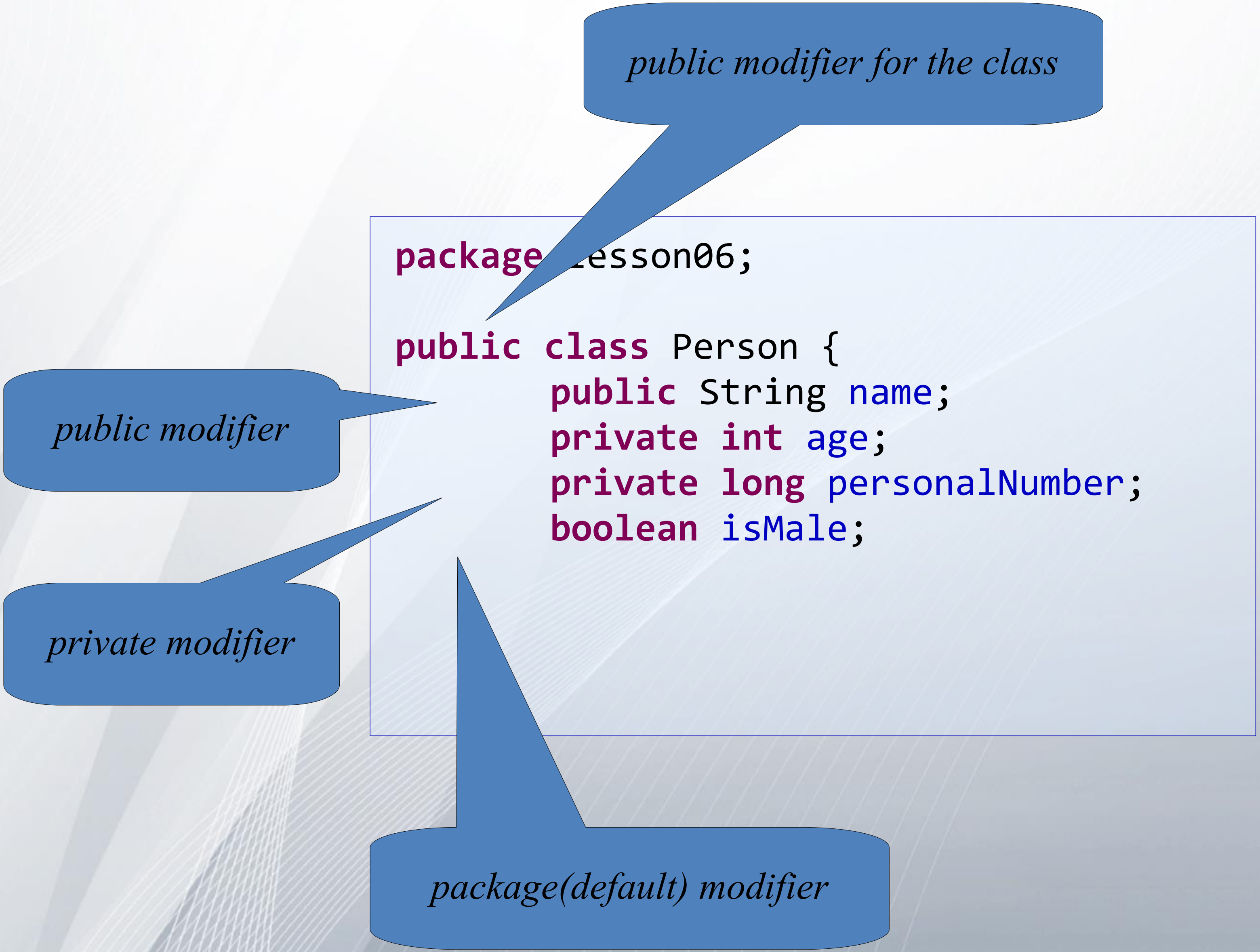
Access modifiers

- Access modifiers are used to

  Control access to classes (top level), methods, constructors or fields (bottom level) from outside the class

- For top level (classes) there are *public, package* and in some cases *private(inner classes)*
- For bottom level: *public, protected, package* and *private*

Access modifiers example



```
package lesson06;

public class Person {
        public String name;
        private int age;
        private long personalNumber;
        boolean isMale;
```

public modifier for the class

public modifier

private modifier

package(default) modifier

Explaining *public*, *private* and *default*

- public – gives access to the class, field or method from everywhere outside the class
- private – access is restricted only within the class
- default/package – visible from within the class and all other classes in the package
- Protected – we'll talk about it in the next lessons because it's related to inheritance

Purpose of access modifiers

- Problem: If all fields of class Person are public they will be accessible from everywhere which evaluates the Encapsulation principle of OOP
- Accessibility directly to fields is dangerous and unsecure
- For accessing private fields outside the class are used public methods called „getter“ and „setter“

Getters and setters

- Getters are used for getting the value of private field outside the class.
- It should be implemented only if is neccessary
- Setters are void methods and are used for setting the value of private field outsite the class
- Validation can be implemented as part of the setter's body

```
        private int age;

        public int getAge() {
                return age;
        }

        public void setAge(int age) {
                if(age >= 0) {
                        this.age = age;
                }
        }
```

Using keyword *final* for fields

- Can be used for fields, parameters, local variables and classes.
- Used for field, it indicates that the field is constant Once a value is assigned, it cannot be changed during the whole program execution.
- Convension – use uppercase and "_" to separate words(for static final fields)
- Constants must be initialized either after declaring, or in the constructor

```
        private final String NAME = "Ivan";
        private int age = 14;
```

Using keyword *final* for method's parameters

- The same logic as when using with fields - the parameter cannot be changed in the method's body

```
public void setAgeFromOtherPerson(final Person person) {
        this.age = person.getAge();
}
```

- !!! Be careful with fields and parameters of some reference type:

Setting fields or argument of some reference type as final don't guarantee that its state won't be changed. It only guarantee that the reference won't be changed.

Using keyword *final* for variable in some block of code

Compile error

```
public class Demo {
       public static void main(String[] args) {
              Car bmw = new Car("BMW 330", true, "Red");
              Car ford = new Car("Ford Fiesta", false, "Black",
2000, 330);
              final Car myCar = bmw;
              myCar = ford;

              final int myAge = 20;
              myAge = 21;
       }
}
```

Compile error

Static fields

- Keyword *static* indicate the field as static
- Static fields belong to the class – not the instances of a class
- Static fields are shared between the objects because they belong to the class
- Static reference can be and should be referenced via class' name

Static fields

If some object change the value of a static fields, its changed in all object of this class

Try it with few simple classes!

Exercise

```
public class A {
        public static int x = 0;
        public int y = 4;

        public A(int x, int y){
                this.x = x;
                this.y = y;
        }

        public static void main(String[] args) {
                A a1 = new A(2,3);
                A a2 = new A(7, 9);

                System.out.println(a1.x);
                System.out.println(a2.y);
                a2.y++;
                a1.x += a2.y;
                System.out.println(a1.x);
                a2.y = a1.y - 1;
                System.out.println(a2.y);
        }
}
```

What will be the output from the main method?

Static methods

- Again static keyword is used
- Static method can be and should be called via class name, not via instance of its class
- Static methods CANNOT used non static fields of the class
- main method is example of static method

```
public class Test {
        public static void main(String[] args) {
                double c = Math.pow(2, 10);
                System.out.println(c);
        }
}
```

main method is static

Calling static method of class Math

Summary

- What is package
- What is encapsulation and how to achieve it
- Access modifiers
- Getters and setters – purpose and usage
- Final keyword – purpose and initialization of final fields
- Static fields and methods
- How to refer static fields and call static methods