Chapter 5: Classes and Objects in Depth

Getters, Setters and Constructors

How Private Attributes could be Accessed

- Private attributes are not accessible from outside.
  - Except from objects of the same class.
- They are accessible:
  - From inside: from the object containing the data itself.
  - From objects of the same class.
- They are accessible from outside using accessor operations:
  - Getters
  - Setters

```
class Course {

    // Data Member
    private String studentName;
    private String courseCode ;

}
```

```
public class CourseRegistration {
    public static void main(String[] args) {
        Course course1, course2;
//Create and assign values to course1
        course1 = new Course( );
        course1.courseCode= "CSC112";
        course1.studentName= "Majed AlKebir";

//Create and assign values to course2
        course2 = new Course( );
        course2.courseCode= "CSC107";
        course2.studentName= "Fahd AlAmri";

        System.out.println(course1.studentName + " has the course "+
                                                course1.courseCode);
        System.out.println(course2.studentName + " has the course "+
                                                course2.courseCode);

    }
}
```

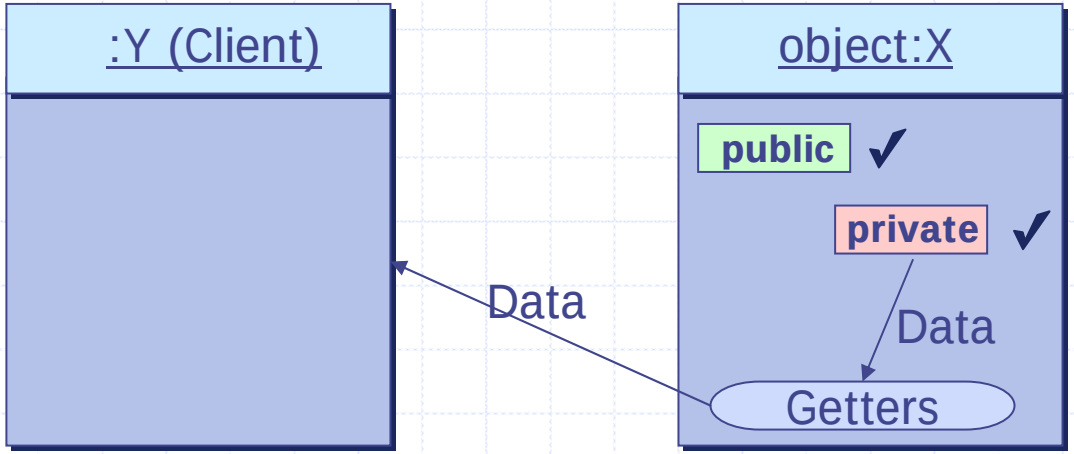
Getters

The object point of view

- Are operations performed by the object returning to outsiders data retrieved from the object state.

The user point of view

- Are services called from outside allowing to retrieve data from the object state.



Getters are:
- Public
- With no parameters
- With return value

Template for Getters

```
public class ClassName {
    private dataType1 attribute1;
    . . .
    private dataTypen attributen;
    . . .

    public dataType1 getAttribute1() {
        return attribute1;
    }

    . . .

    public dataTypen getAttributen() {

        return attributen;
    }
    . . .
 }
```

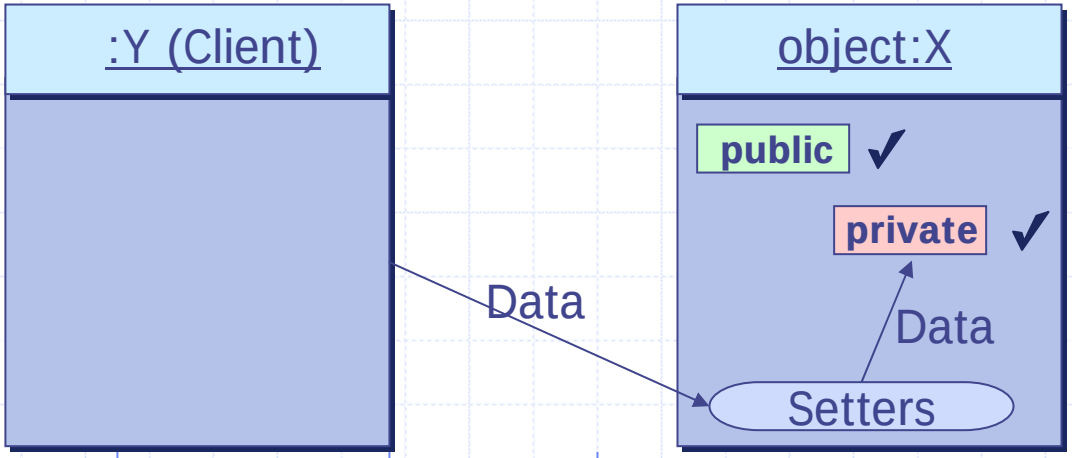
Setters

The object point of view

- Are operations performed by the object allowing to receive and store in the object state the data provided by outsiders.

The user point of view

- Are services used by outsiders allowing to provide to the object the data that should be stored in the object state.



Setters are:
- Public
- With 1 parameter
- With no return value

Template for Setters

```
public class ClassName {
    private dataType1 attribute1;
    . . .
    private dataTypen attributen;
    . . .

    public void setAttribute1(dataType1 param){
        attribute1 = param;
    }
    . . .
    public void setAttributen(dataTypen param) {
        attributen = param;
    }
    . . .
}
```

```
public class Course {

    // Attributes
    private String studentName;
    private String courseCode ;

    ...
    public String getStudentName() {
        return studentName;
    }
    public String getCourseCode() {
        return courseCode;
    }
    ...
    public void setStudentName(String val) {
        studentName = val;
    }
    public void setCourseCode(String val) {
        courseCode = val;
    }

}
```

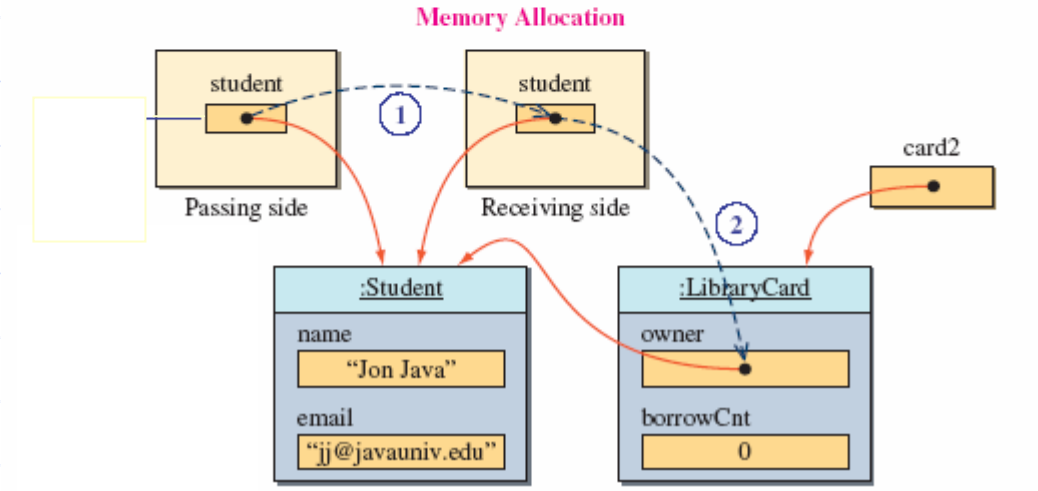
```
public class CourseRegistration {
    public static void main(String[] args) {
        Course course1, course2;
//Create and assign values to course1
        course1 = new Course( );
        course1.setCourseCode("CSC112");
        course1.setStudentName("Majed AlKebir");

//Create and assign values to course2
        course2 = new Course( );
        course2.setCourseCode("CSC107");
        course2.setStudentName("Fahd AlAmri");

        System.out.println(course1.getStudentName() +
                " has the course " +  course1.getCourseCode());
        System.out.println(course2.getStudentName() +
                " has the course " + course2.getCourseCode());

    }
}
```

Passing an Object to a Setter

```
LibraryCard card2;     Passing side

card2 = new LibraryCard( );

card2.setOwner(student);
```

```
class LibraryCard {

 public void setOwner(Student student) {
    owner = student;
 }
}
```

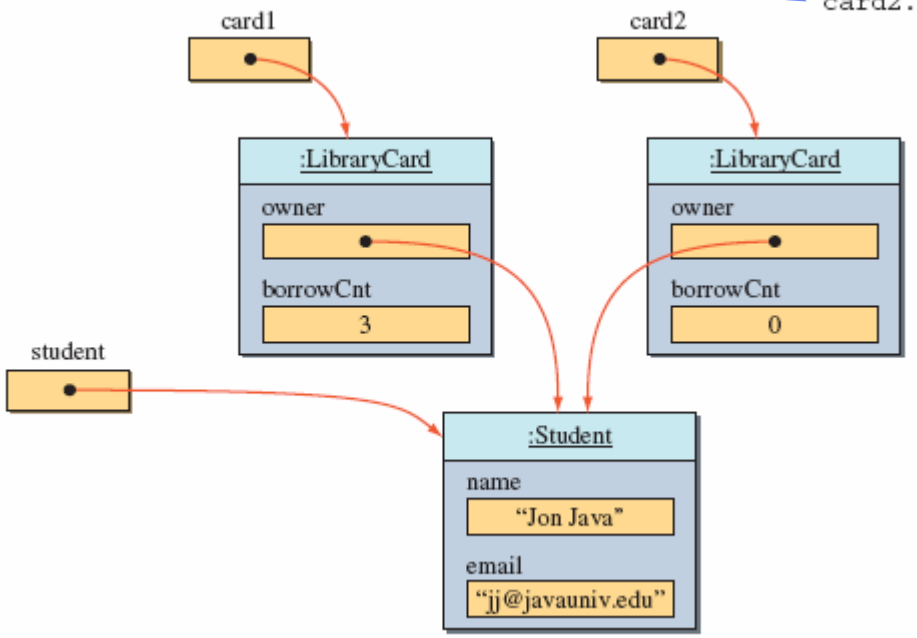
Receiving side



Setters and Sharing Objects

- The same Student object reference is passed to card1 and card2 using setters

```
Student    student;
LibraryCard card1, card2;

student = new Student( );
student.setName('Jon Java');
student.setEmail('jj@javauniv.edu");

card1 = new LibraryCard( );
card1.setOwner(student);
card1.checkOut(3);

card2 = new LibraryCard( );
card2.setOwner(student); //the same student is the owner
                         //of the second card, too
```



- Since we are actually passing the same object reference, it results in the owner of two LibraryCard objects referring to the same Student object

Class Constructors

- A class is a blueprint or prototype from which objects of the same type are created.
- Constructors define the initial states of objects at birth.
  - ***ClassName x = new ClassName();***
- A class contains at least one constructor.
- A class may contain more than one constructor.

The Default Class Constructor

- If no constructors are defined in the class, the default constructor is added by the compiler at compile time.

- The default constructor does not accept parameters and creates objects with empty states.
  - ***ClassName x = new ClassName();***

Class Constructors Declaration

```
public  <constructor name>  ( <parameters>  ){
        <constructor body>
}
```

- The ***constructor name***: a constructor has the same names as the class .
- The ***parameters*** represent values that will be passed to the constructor for initialize the object state.
- Constructor declarations look like method declarations except that:
  - they use the name of the class
  - and have no return type.

Example of a Constructor with No-Parameter

```
public class Kasree {
    private int bast;
    private int maquam;
    public Kasree() {
        bast = 0; maquam =1;
    }
    . . .
}
```

```
Kasree x;
x = new Kasree ( ) ;
```

A

B

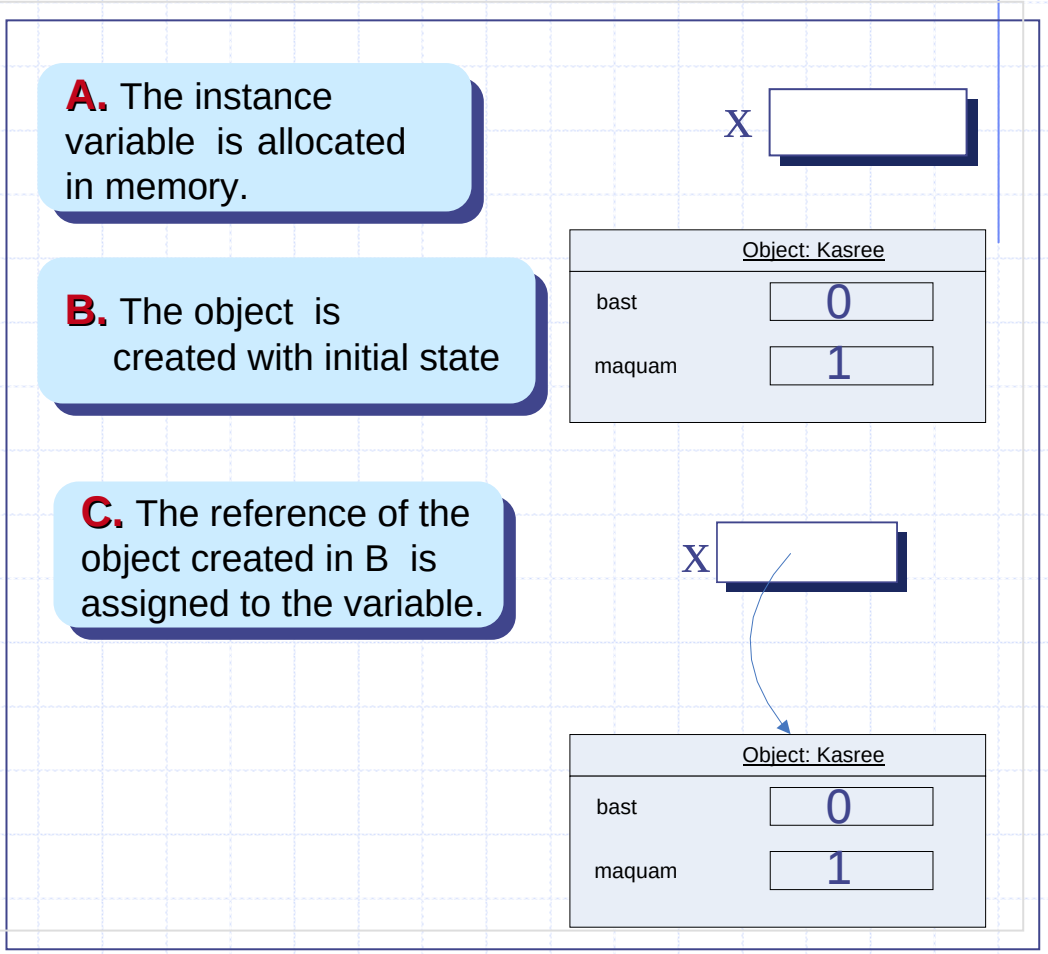
C

Code

A. The instance variable is allocated in memory.

B. The object is created with initial state

C. The reference of the object created in B is assigned to the variable.



State of Memory

Class with Multiple Constructors

```
public class Kasree {
    private int bast;
    private int maquam;

    public Kasree() {
        bast = 0; maquam =1;
    }
    public Kasree(int a, int b) {
        bast = a;
        if (b != 0) maquam = b;
        else maquam = 1;
    }
    . . .
}
```

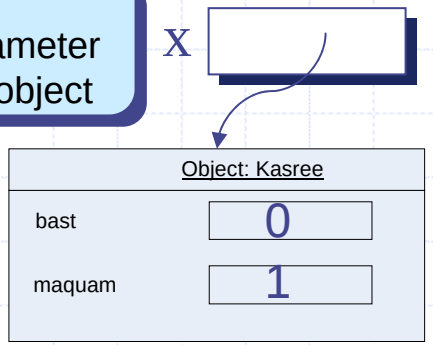
```
Kasree x , y;

x   =  new Kasree()

y   = new Kasree(4, 3);
```

A

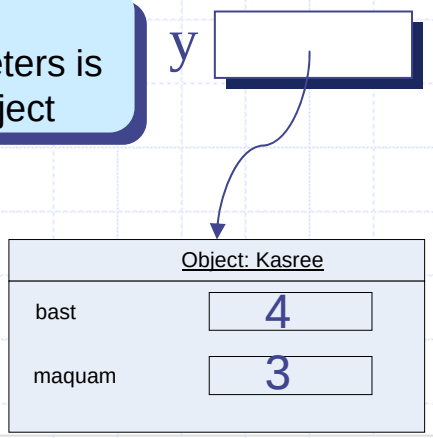
B

Code

A. The constructor declared with no-parameter is used to create the object



B. The constructor declared with parameters is used to create the object



State of Memory

Overloading

- Two of the components of a method declaration comprise the *method signature:*
  - the method's name
  - and the parameter types.
- The signature of the constructors declared above are:
  - Kasree()
  - Kasree(int, int)
- *Overloading* methods allows implementing different versions of the same method with different *method signatures*.
  - This means that methods within a class can have the same name if they have different parameter lists.

Overloading (cont.)

- Overloaded methods are differentiated by:
  - the number,
  - and the type of the arguments passed into the method.
- You cannot declare more than one method with:
  - the same name,
  - and the same number and type of parameters.
- The compiler does not consider return type when differentiating methods.
  - No declaration of two methods having the same signature even if they have a different return type.

Intra-Constructors Calls

- A constructor of a class may use an other constructor of the same class.

```
public class Kasree {
    private int bast;
    private int maquam;

    public Kasree(int a, int b) {
        bast = a;
        if (b != 0) maquam = b;
        else maquam = 1;
    }

    public Kasree() {
        Kasree(0, 1);
    }
. . .
}
```

```
Kasree x , y;

x   =  new Kasree()
y   = new Kasree(4, 3);
```

Client Side