Understanding Encapsulation Using Examples

In this lesson, you will get a firmer understanding of encapsulation in Java with the help of examples.

WE'LL COVER THE FOLLOWING

As discussed earlier, encapsulation refers to the concept of binding **data and the methods operating on that data** in a single unit also called a class.

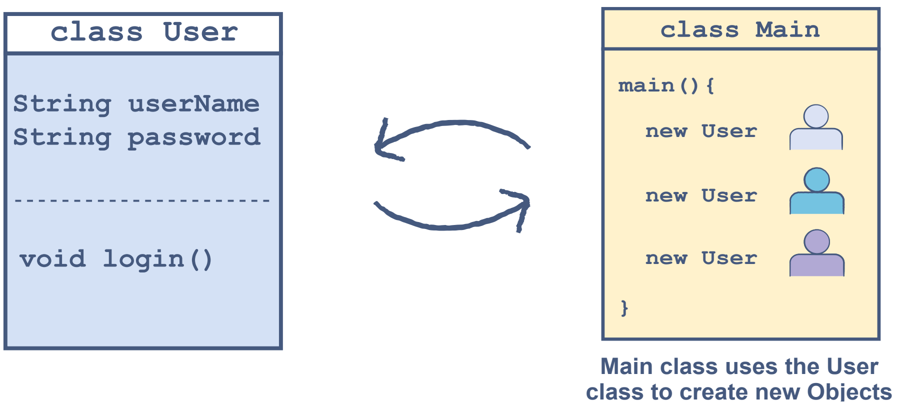
The goal is to prevent this bound data from any unwanted access by the code outside this class. Let's understand this using an example of a very basic `User` class.

Consider that we are up for designing an application and are working on modeling the **log in** part of that application. We know that a user needs a **username** and a **password** to log into the application.

A very basic `User` class will be modeled as:

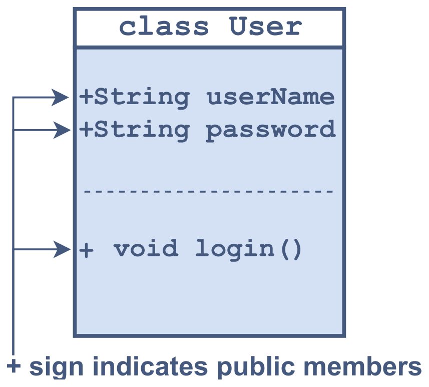
- Having a field for the `userName`
- Having a field for the `password`
- A method named `login()` to grant access

Whenever a new user comes, a new object can be created by passing the `userName` and `password` to the constructor of this class.



A Bad Example

Now it is time to implement the above discussed `User` class.



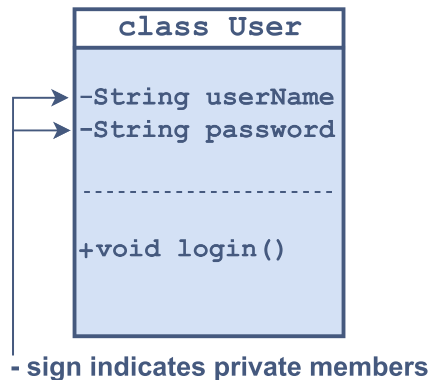
The code according to the above illustration is given below:

```
// User Class
class User {

  // Public Fields
  public String userName;
  public String password;


  // Parameterized Constructor to create new users
  public User(String userName, String password) {
    this.userName = userName;
    this.password = password;
  }

  public void login(String userName, String password) {
    //Check if the username and password match
    if (this.userName.toLowerCase().equals(userName.toLowerCase()) && this.password.equals(pa
    // .toLowrcase converts all the characters to lowercase & .equals checks if two strings m

      System.out.println("Access Granted against the username: "+this.userName +" and passwor
    }
    else System.out.println("Invalid Credentials!"); //Else invalid credentials
  }

}

class Main {

  public static void main(String[] args) {
    User educative = new User("Educative","12345"); //Creates a new user and stores the passw

    educative.login("Educative","12345"); //Grants access because credentials are valid

    educative.login("Educative", "3456"); //Does not grant access because the credentials are

    educative.password = "3456"; //OOPS SOMEONE ACCESSED THE PASSWORD FIELD

    educative.login("Educative", "3456"); // GRANTS ACCESS BUT THIS SHOULD NOT HAVE HAPPENED!
  }

}
```

In the above coding example, we can observe that **anyone** can *access, change or print* the `password` and `userName` fields directly from the `main()` method. This is **dangerous** in the case of this `User` class because there is no encapsulation of the credentials of a user and anyone can access their account by manipulating the stored data. So the above code was not a good coding convention.

A Good Example

Let's move on to a good convention for implementing the `User` class!



```
// User Class
class User {

  // Private fields
  private String userName;
  private String password;

  //Parameterzied constructor to create a new users
  public User(String userName, String password) {
    this.userName = userName;
    this.password = password;
  }

  public void login(String userName, String password) {
    //Check if the username and password match
    if (this.userName.toLowerCase().equals(userName.toLowerCase()) && this.password.equals(pa
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    educative.login("Educative", "3456"); //Does not grant access because the credentials are

    //educative.password = "3456"; //Uncommenting this line will give an error
                                   //Fields of User class cannot be accessed now
  }

}
```

In the above example, the fields of `userName` and `password` are declared `private`.

As a rule of thumb, in a class, all the member variables should be declared `private` and to access and operate on that data `public` methods like *getters, setters and custom methods* should be implemented.

This is the concept of encapsulation. All the field containing data are private and the methods which provide an interface to access those fields are public.

Now let’s test your understanding of encapsulation with the help of a quick quiz!