

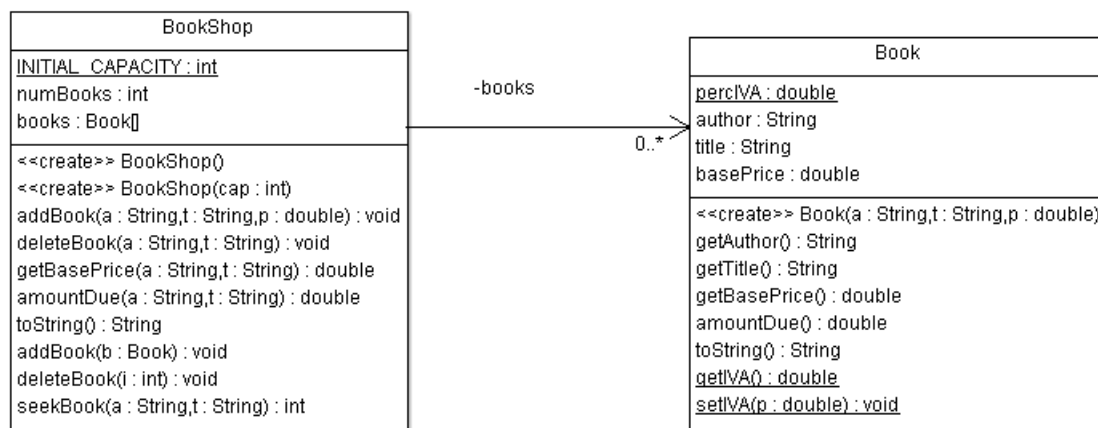
Contents

These exercises will help you to use class composition. In order to achieve this goal, you will use object arrays. In addition, we will distinguish between instance variables (or object attributes) and class variables (or class attributes that could be or nor constant values). Please, remember that class methods only can access to class variables. We also learn by doing the importance of using private methods for a better code organization and we will practice basic operations over incomplete arrays.

Note. You always can add any private method you need.

Exercise 1 (project prBookShop)

This exercise will develop some classes representing books and a book shop.



Book class

Book class in prBookShop has all the information about a book: name of the author, title and base price. In addition, it has information about added value tax percentage (IVA) that must be added in order to calculate the amount due to pay.

Note that IVA will be the same for every book and its value is 10.00%.

- **public** Book(String , String , double)
it will create a new object setting its author, title and base price.
- **public** String getAuthor()
it will return the author of the book.
- **public** String getTitle()
it will return the title of the book.
- **public double** getBasePrice()
it will return the base price of the book.
- **public double** amountDue()
it will return the amount due to pay for the book (base price + taxes).
- **public** String toString()
it will return the object as one string in the format
(author; title; base price; tax percentage; amount due)
Example: (Isaac Asimov; La Fundación; 7.30; 10.0%; 8.03)
- **public static double** getIVA()
it will return the tax percentage for every book.
- **public static void** setIVA(double)
it will set the tax percentage for every book.

BookShop class

BookShop class in prBookShop stores some books in one array. It also remembers how many books are stored in the book shop. In addition, the class has a constant value telling the size of the array by default (that will be 16).

- **public** BookShop()
it will create an empty book shop (no books) where the size (capacity) of the array is the value by default .
- **public** BookShop(**int**)
it will create an empty book shop (no books) where the size (capacity) of the array is given parameter.
- **public void** addBook(String a, String t, **double** p)
it will create a new book using given parameters. Then it will look for the book in the book shop (searching by author and title). If you find it, it will be replaced by the new one. Else, you will add the new book to the book shop. When the array is full, you have to duplicate the size of the array before adding the new book and you also have to update the number of books in the book shop when needed.

It will invoke to addBook(Book)

- **public void** deleteBook(String a, String t)
it will delete the book in the book shop (searching by author and title). If you don't find it, nothing will be done. You also have to update the number of books in the book shop when deleting a book.

It will invoke to seekBook(String, String) and deleteBook(**int**)

- **public double** getBasePrice(String a, String t)
it will return the base price of book in the book shop (searching by author and title). If you don't find it, it will return 0.

It will invoke to seekBook(String, String)

- **public double** amountDue(String a, String t)
it will return the amount due to pay for a book in the book shop (searching by author and title). If you don't find it, it will return 0.

It will invoke to seekBook(String, String)

- **public** String toString()
it will return the object as one string in the format of
[<book>,
<book>,
...
<book>]

Example:

```
[(George Orwell; 1984; 6.20; 10.0%; 6.82),  
(Philip K. Dick; ¿Sueñan los androides con ovejas eléctricas?; 3.50;  
10.0%; 3.85),  
(Isaac Asimov; Fundación e Imperio; 9.40; 10.0%; 10.34),  
(Ray Bradbury; Fahrenheit 451; 7.40; 10.0%; 8.14),  
(Alex Huxley; Un Mundo Feliz; 6.50; 10.0%; 7.15),  
(Isaac Asimov; La Fundación; 7.30; 10.0%; 8.03),  
(William Gibson; Neuromante; 8.30; 10.0%; 9.13),  
(Isaac Asimov; Segunda Fundación; 8.10; 10.0%; 8.91),  
(Isaac Newton; Arithmetica Universalis; 10.50; 10.0%; 11.55)]
```

- **private void** addBook(Book)
Private method that will look for a book in the array (searching by author and title). If you find it, it will be replaced by the new one. Else, new book will be added to the array. When the array is full, you have to duplicate the size of the array before adding the new book and you also have to update the number of books in the book shop when needed.
- **private void** deleteBook(int)
it will delete the book which is in the index given by the parameter. In order to do that, book stored in that index will be replaced by the last book, last book index will be null and the number of books will be decremented.
- **private int** seekBook(String, String)
it will return the index where a book is in the array (searching by author and title). If you don't find it, it will return -1.
Note that searching process is not case sensitive.

BookShopTest application

You have to develop an application named BookShopTest for Book and BookShop classes testing. Main program has to add the following books:

```
("george orwell", "1984", 8.20)
("Philip K. Dick", "¿Sueñan los androides con ovejas eléctricas?", 3.50)
("Isaac Asimov", "Fundación e Imperio", 9.40)
("Ray Bradbury", "Fahrenheit 451", 7.40)
("Alex Huxley", "Un Mundo Feliz", 6.50)
("Isaac Asimov", "La Fundación", 7.30),
("William Gibson", "Neuromante", 8.30)
("Isaac Asimov", "Segunda Fundación", 8.10)
("Isaac Newton", "arithmetica universalis", 7.50)
("George Orwell", "1984", 6.20)
("Isaac Newton", "Arithmetica Universalis", 10.50)
```

Then you print the book shop and you will get

```
[(George Orwell; 1984; 6.2; 10.0%; 6.82),
 (Philip K. Dick; ¿Sueñan los androides con ovejas eléctricas?; 3.5;
 10.0%; 3.85),
 (Isaac Asimov; Fundación e Imperio; 9.4; 10.0%; 10.34),
 (Ray Bradbury; Fahrenheit 451; 7.4; 10.0%; 8.14),
 (Alex Huxley; Un Mundo Feliz; 6.5; 10.0%; 7.15),
 (Isaac Asimov; La Fundación; 7.3; 10.0%; 8.03),
 (William Gibson; Neuromante; 8.3; 10.0%; 9.13),
 (Isaac Asimov; Segunda Fundación; 8.1; 10.0%; 8.91),
 (Isaac Newton; Arithmetica Universalis; 10.5; 10.0%; 11.55)]
```

Now you delete the following books

```
("George Orwell", "1984")
("Alex Huxley", "Un Mundo Feliz")
("Isaac Newton", "Arithmetica Universalis")
```

And print the book shop and you will get

```
[(William Gibson; Neuromante; 8.3; 10.0%; 9.13),
 (Philip K. Dick; ¿Sueñan los androides con ovejas eléctricas?; 3.5;
 10.0%; 3.85),
 (Isaac Asimov; Fundación e Imperio; 9.4; 10.0%; 10.34),
 (Ray Bradbury; Fahrenheit 451; 7.4; 10.0%; 8.14),
 (Isaac Asimov; Segunda Fundación; 8.1; 10.0%; 8.91),
 (Isaac Asimov; La Fundación; 7.3; 10.0%; 8.03)]
```

Finally, you will show the amount due to pay for the following books:

```
amountDue(George Orwell, 1984) 0.0
amountDue(Philip K. Dick, ¿Sueñan los androides con ovejas eléctricas?)
3.85
amountDue(isaac asimov, Fundación e imperio) 10.34
amountDue(Ray Bradbury, Fahrenheit 451) 8.14
amountDue(Alex Huxley, Un Mundo Feliz) 0.0
amountDue(Isaac Asimov, La Fundación) 8.03
amountDue(william gibson, neuromante) 9.13
amountDue(Isaac Asimov, Segunda Fundación) 8.91
amountDue(Isaac Newton, Arithmetica Universalis) 0.0
```