# DATABASE SYSTEMS PROJECT REPORT:
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I used Java (NetBeans) to create the GUI , to compute the database related operations and phpMyAdmin to create the tables and add data into the those tables. I'm planning the introduce my project for the library system called 'LIBSAN' with in two sections; Database Introduction and LIBSAN demo which can be considered as a manual for the users.

I. DATABASE INTRODUCTION

Here is how the relation between my tables looks like:
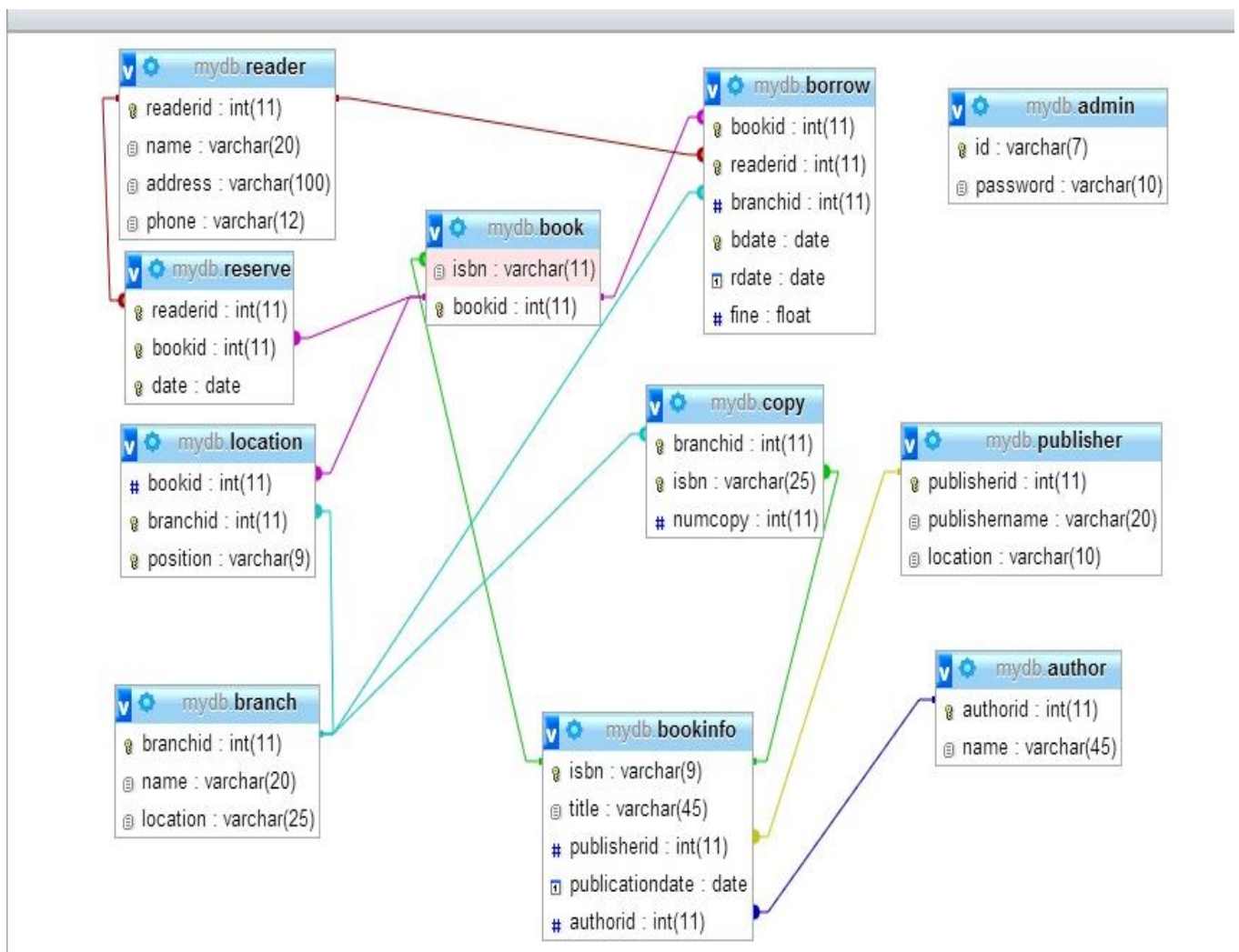
I have 11 tables; *admin*, *reader*, *borrow*, *reserve*, *book*, *bookinfo*, *copy*, *location*, *publisher*, *author*, and *branch*.

Explanations for each table:

admin Table: this table is only used to check the admin login and has only two attributes which are id and password. I created only three admin accounts, so there are three rows. It has no relation with the other tables.

Column Name	Datatype	PK	NN	UQ	BIN	UN	ZF	AI	Default
🔑 id	VARCHAR(7)	✓	✓	☐	☐	☐	☐	☐	
◆ password	VARCHAR(10)	☐	✓	☐	☐	☐	☐	☐	

bookinfo Table: this table is used to hold book related information as isbn (PK) , title, publisherid (linked to the publisher.publisherid), publicationdate, and authorid(linked to the author.authorid). There are 32 entries in this table.

Column Name	Datatype	PK	NN	UQ	BIN	UN	ZF	AI	Default
🔑 isbn	VARCHAR(9)	✓	✓	☐	☐	☐	☐	☐	
◆ title	VARCHAR(45)	☐	✓	☐	☐	☐	☐	☐	
◆ publisherid	INT(11)	☐	✓	☐	☐	☐	☐	☐	
◆ publicationdate	DATE	☐	✓	☐	☐	☐	☐	☐	
◆ authorid	INT(11)	☐	✓	☐	☐	☐	☐	☐	

book Table: this table is used to hold the information for isbn and the id of each book (bookid -> is also the primary key of this table) and isbn is linked to the bookinfo.isbn.

Column Name	Datatype	PK	NN	UQ	BIN	UN	ZF	AI	Default
◆ isbn	VARCHAR(11)	☐	✓	☐	☐	☐	☐	☐	
🔑 bookid	INT(11)	✓	✓	☐	☐	☐	☐	✓	

I assumed that each copy of the book has different bookid which concludes books have different ids but same isbn. There are 160 entries in this table and I set the bookid as auto incremented, so when you add a new book into this table it'll increment automatically.

i.e.,

```
SELECT *
FROM `book`
WHERE isbn =001005
ORDER BY `book`.`bookid` ASC
LIMIT 0 , 30
```

Show : Start row: 0   Number of rows: 30   Headers every 100

Sort by key: None ▼

+ Options

←T→		isbn	bookid ▲
☐ ✎ Edit ⌗ Copy ⊖ Delete		001005	2
☐ ✎ Edit ⌗ Copy ⊖ Delete		001005	3

```
SELECT title
FROM `bookinfo`
WHERE isbn =001005
LIMIT 0 , 30
```

Show : Start row: 0   Number of rows: 30

+ Options

←T→	title
☐ ✎ Edit ⌗ Copy ⊖ Delete	Dancers Rise

publisher table: this table holds the publisherid(PK), publishername and their locations. There are 19 entries in this table. publisherid is set as AUTO_INCREMENT.

Column Name	Datatype	PK	NN	UQ	BIN	UN	ZF	AI	Default
🔑 publisherid	INT(11)	✓	✓	☐	☐	☐	☐	✓	
◇ publishername	VARCHAR(20)	☐	✓	☐	☐	☐	☐	☐	
◇ location	VARCHAR(10)	☐	✓	☐	☐	☐	☐	☐	

author table: this table holds the information of the authors as authorid (P.K) which AUTO_INCREMENTED, and name. There are 16 entries in this table.

Column Name	Datatype	PK	NN	UQ	BIN	UN	ZF	AI	Default
authorid	INT(11)	✓	✓	☐	☐	☐	☐	✓	
name	VARCHAR(45)	☐	✓	☐	☐	☐	☐	☐	

branch table: this table holds the information about the branches as branchid (P.K and A_I), name , and location. There are 21 branches I made up for this table, assumed or branches are in New York and locations are Kips Bay, Downtown, Chinatown, Brooklyn, and goes on..

Column Name	Datatype	PK	NN	UQ	BIN	UN	ZF	AI	Default
branchid	INT(11)	✓	✓	☐	☐	☐	☐	✓	
name	VARCHAR(20)	☐	✓	☐	☐	☐	☐	☐	
location	VARCHAR(25)	☐	✓	☐	☐	☐	☐	☐	

copy table: this table is used to hold the information about the copy number for each book in each branch. The attributes are isbn, branchid, and the numcopy (the number of copies). isbn and branchid togethere is the Primary Key.

Column Name	Datatype	PK	NN	UQ	BIN	UN	ZF	AI	Default
branchid	INT(11)	✓	✓	☐	☐	☐	☐	☐	
isbn	VARCHAR(25)	✓	✓	☐	☐	☐	☐	☐	
numcopy	INT(11)	☐	✓	☐	☐	☐	☐	☐	

branchid is linked to branch.branchid and isbn is linked to bookinfo.isbn.

There are 119 entries in this table which I really worked on doing it coherent with the location table.

isbn ▲	title	publisherid	publicationdate	authorid
004007	Two Pairs of Shoes	12	1976-03-03	13

BOOKINFO

2	004007	1
7	004007	1
3	004007	2
1	004007	2
1	004007	5

COPY TABLE

7 copies for book "Two Pairs of Shoes". 1 of them is in branch with id 2, 1 of them is in branch with id 7, 2 of them is in branch with id 3 and the rest 2 of them are in branch with id 1.

Delete	004007	86
Delete	004007	87
Delete	004007	88
Delete	004007	108
Delete	004007	107
Delete	004007	106

BOOK TABLE

The ids of the copies of book named "Two Pairs of Shoes" are 86, 87, 88, 106, 107 and 108.

So from the table location:

108	7	004A08
107	3	008A07
106	3	002A04

Well.. There are 2 of them in branch 3, one in branch 7.

88	2	005A08
87	1	007A05
86	1	002A02

And.. there are 2 of them in branch 1 and one in branch 2.

The sample seems coherent!

Please, keep in mind that I tried to do copy table coherent with the table location but there might have some mistakes since it's a large amount of data I might missed some of them or might be mistaken while adding them!

location table: this table holds the information for each book, and where they are (with branch information and physical position in that branch). The data added into this table is compatible with the number of copies for each book given in table copy.

Column Name	Datatype	PK	NN	UQ	BIN	UN	ZF	AI	Default
◆ bookid	INT(11)	☐	✓	☐	☐	☐	☐	☐	
🔑 branchid	INT(11)	✓	✓	☐	☐	☐	☐	☐	
🔑 position	VARCHAR(9)	✓	✓	☐	☐	☐	☐	☐	

reader table: this table holds the information about reader as readerid (which is P.K and A_I), name, address and phone number.

Column Name	Datatype	PK	NN	UQ	BIN	UN	ZF	AI	Default
🔑 readerid	INT(11)	✓	✓	☐	☐	☐	☐	✓	
◆ name	VARCHAR(20)	☐	✓	☐	☐	☐	☐	☐	
◆ address	VARCHAR(100)	☐	✓	☐	☐	☐	☐	☐	
◆ phone	VARCHAR(12)	☐	✓	☐	☐	☐	☐	☐	

Table has 113 entries all were generated by a using a website ☺

reserve table: This table has the information about the reserved books. readerid, bookid, and date together is the primary key since we allow a user to reserve the same book more than one time.

Column Name	Datatype	PK	NN	UQ	BIN	UN	ZF	AI	Default
🔑 readerid	INT(11)	✓	✓	☐	☐	☐	☐	☐	
🔑 bookid	INT(11)	✓	✓	☐	☐	☐	☐	☐	
🔑 date	DATE	✓	✓	☐	☐	☐	☐	☐	

readerid is linked to reader.readerid and bookid is linked to book.bookid.

borrow table: this table has the information about the borrowed books and includes readerid, bookid, bdate (stands for borrow date), rdate (stands for return date), and fine (which is a penalty for the non returned books which is calculated as 20 cents for each day after the return date that is 20 days after the borrow date).

Column Name	Datatype	PK	NN	UQ	BIN	UN	ZF	AI	Default
bookid	INT(11)	✓	✓	☐	☐	☐	☐	☐	
readerid	INT(11)	✓	✓	☐	☐	☐	☐	☐	
branchid	INT(11)	☐	✓	☐	☐	☐	☐	☐	
bdate	DATE	✓	✓	☐	☐	☐	☐	☐	
rdate	DATE	☐	☐	☐	☐	☐	☐	☐	NULL
fine	FLOAT	☐	✓	☐	☐	☐	☐	☐	'0'

Since a user can borrow the same book more than one time, bookid, readerid and bdate together is the primary key. rdate is set as NULL by default and it'll remain as NULL till the book is returned by the user. fine is set to 0 by default and it'll be changed if the user returns the book later than he/she is supposed to, otherwise it'll stay as 0.

bookid is linked to book.bookid, readerid is linked to reader.readerid, and branchid is linked to branch.branchid.

For now, there are 78 entries for this table.

II. DATABASE INTRODUCTION

Here is the screenshot of the main menu:
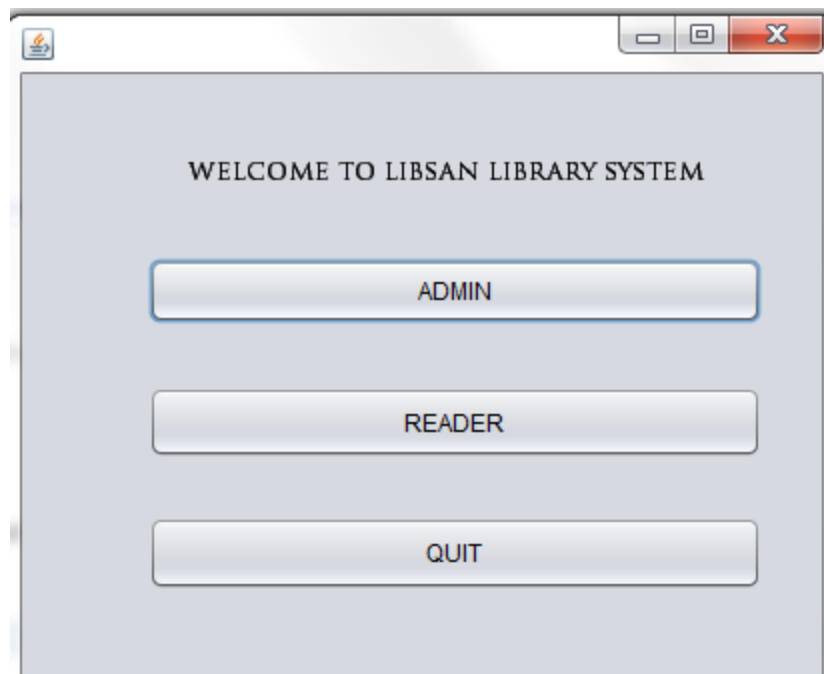
By choosing admin, you'll be accessing to the admin related functions. All you need is admin username or password, or you'll see this screen:

II. I. ADMIN MENU

There are seven different functions that provided to admin user by the system.
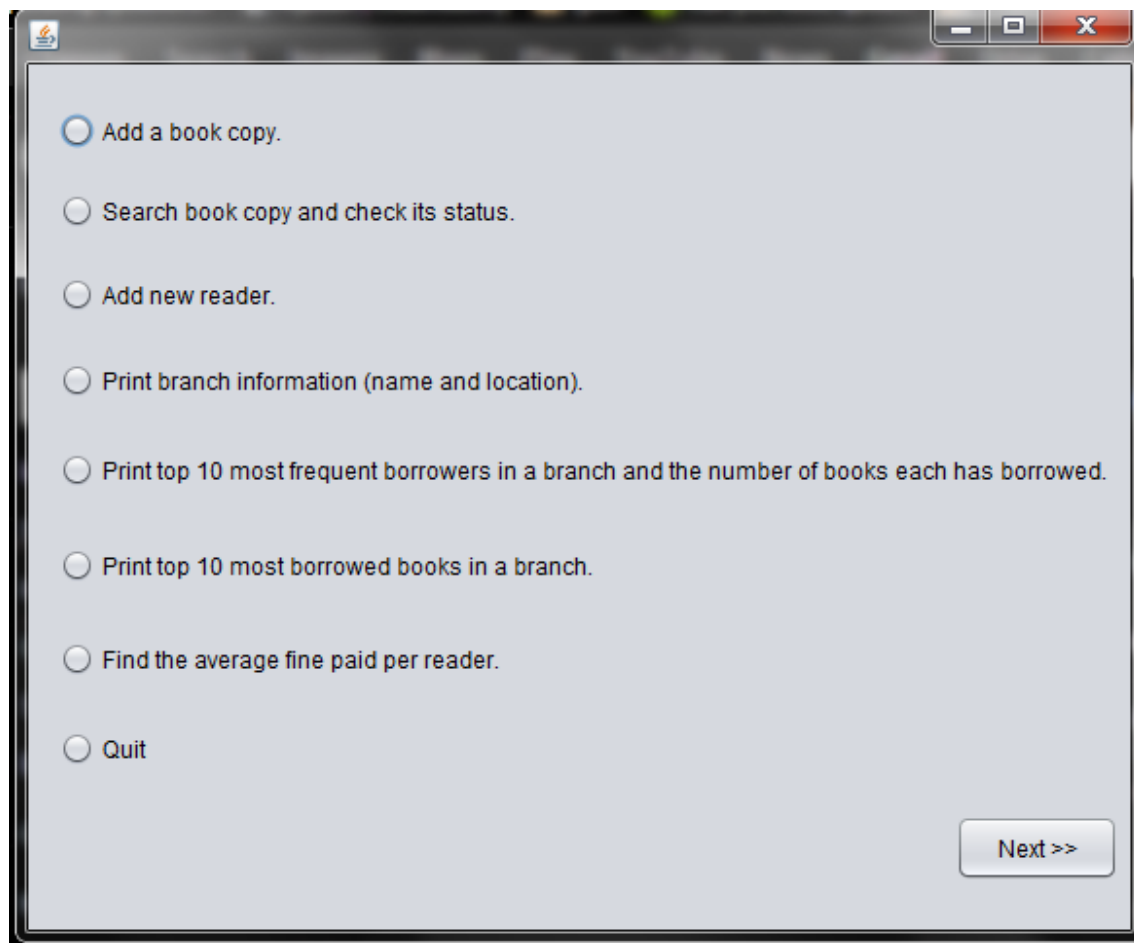
II. I. I ADD A BOOK COPY
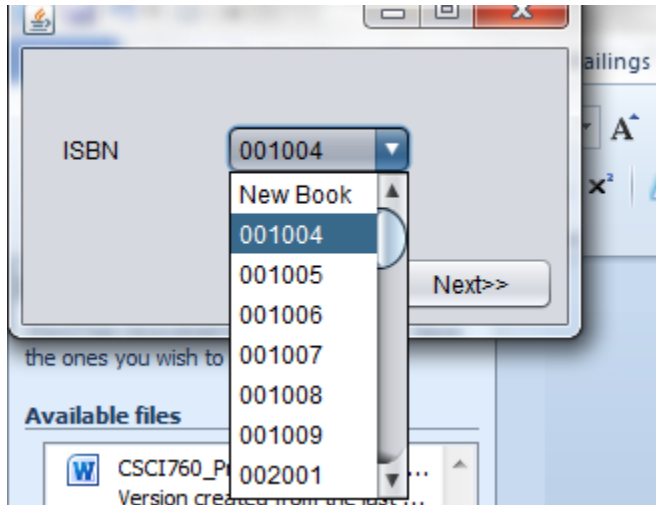
Admin user has to select the isbn number in order to add a copy of a book.

Admin user can choose either New Book or an existing one by selecting it's ISBN number.

Let's see what happens on both..

If the admin user chooses " New Book" , the following screen appears:

A new author name! and a new book!

Author table before and after "Sanem Ucan" :

authorid	name
1	Jennifer Blake
2	Albert Camus
3	Jo Clayton
4	Joanne Greenberg
5	David Weber
6	Annette Broadrick
7	John Osbourne
8	Andrew Mango
9	Virginia Woolf
10	Paul Auster
11	Alex Sanchez
12	Steven Johnson
13	Pamela Travers
14	Marcus J. Goldman
15	Sterling Malory Archer
16	Jeff Smith

authorid	name
1	Jennifer Blake
2	Albert Camus
3	Jo Clayton
4	Joanne Greenberg
5	David Weber
6	Annette Broadrick
7	John Osbourne
8	Andrew Mango
9	Virginia Woolf
10	Paul Auster
11	Alex Sanchez
12	Steven Johnson
13	Pamela Travers
14	Marcus J. Goldman
15	Sterling Malory Archer
16	Jeff Smith
17	Sanem Ucan

branchid	name	location
1	Miller	Downtown

isbn	bookid
A010203	188

Let's check the copy and location tables:

branchid	isbn	numcopy
1	A010203	1

bookid	branchid	position
188	1	004A10

COMPLETED

Book has been added to the system

OK

YES, IT HAS!!
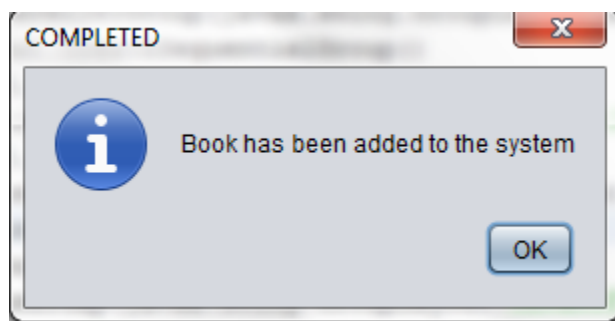
If the admin chooses existing book, the following screen comes up (a combo box of the branches and available slots in their bookcases):

BRANCH	Grease ▼
POSITION	003A10 ▼
<<BACK	NEXT>>

Grease is a branch in Upper East Side with branch id 3!

3	Grease	Upper East	

By clicking Next button book will be added into the table copy:

3	001004	1

Since there were none of the copies of book with ISBN 001004 located in branch 3, now the number of copies became 1.

Proof:

44	3	001A01
106	3	002A04
14	3	002A05
139	3	003A01
186	3	003A10
43	3	004A07
25	3	006A03
51	3	006A04
107	3	008A07

First column is the bookid and this subtable shows the books in branch 3. So any of them has isbn number 001004?

isbn ▲	bookid
001004	1
001004	186

ISBN 001004 has only two copies : 1 and 186 and only 186 is located in branch 3. Let's check table location!

bookid ▾	branchid	position
e	186	3	003A10

This is actually what the admin user chose in Grease Branch at position 003A10. See above!

COMPLETED

i A Copy of the Book has been added to the system

OK
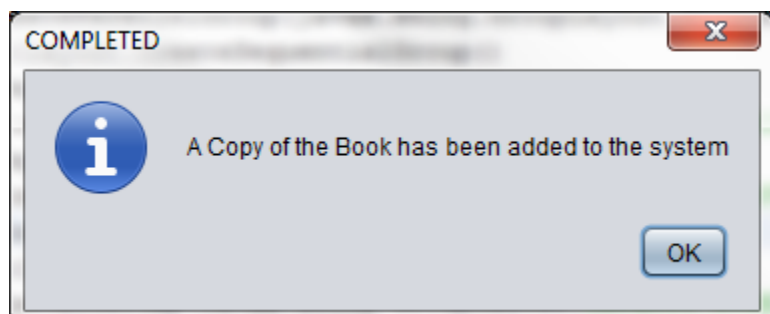
II. I. II SEARCH A BOOK COPY AND CHECK ITS STATUS

PLEASE ENTER THE BOOK NAME TO SEARCH

BOOK NAME   Dancers Rise|

SEARCH

001005	Dancers Rise	
Delete 001005	3
Delete 001005	2

The book Dancers Rise has ISBN number 001005 and has two copies with book id 2 and 3.

2	49811	7	2013-02-24	2013-02-28	0
2	52026	7	2013-12-21	2013-12-31	0
3	49811	7	2013-04-28	NULL	0
3	52026	7	2011-02-27	2011-03-11	0
3	72014	7	2013-01-24	2013-03-05	2
3	89814	7	2010-12-24	2011-01-31	3.6

So the only one of the copies that borrowed was not returned to the library!

But our system checks out the other one with id 2:

| e | 2 | 7 | 008A04 |

| 7 | Kramer | Kips Bay |

BOOK QUERY RESULT

A copy is held by a customer and not returned yet But there are other available copies for you:
At branch Kramer in 008A04

OK

II. I. III ADD NEW READER

Let's do some SQL :
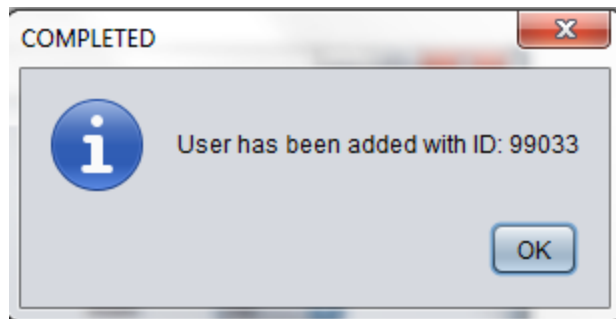**SELECT COUNT(*) AS** count **FROM** `reader`

count
113

| NAME | Sanem Ucan |
| ADDRESS | bla bla bla |

ZIP 10019   State: NE

NE
NV
NH
NJ
NM
NY
NC
ND

PHONE 122-122-1232

User has been added with ID: 99033

OK

readerid ▽	name	address	phone
99033	Sanem Ucan	bla bla bla NY 10019	1221221232

COUNT

114

Also, the result of the same query:

II. I. IV PRINT BRANCH INFORMATION

Name	Location
Miller	Downtown
Domino	Mid West
Grease	Upper East
Helmet	Upper West
Circle	Midtown
Ted's	Gramercy
Kramer	Kips Bay
Joyce	Murray Hill
Gyoza	Chinatown
Kimchi	KTown
Wall	Financial District
Battery	Battery Park
Shake	Harlem
Eataly	East Willage
Lobster Tail	Chelsea
Dumbo	Brooklyn
Park Slope	Brooklyn
Sunny	Queens
Wood	Queens
Island	Roosevelt
Brooklyn College	Brooklyn

OK

II. I. V Print top 10 most frequent borrowers in a branch and the number of books each has borrowed.
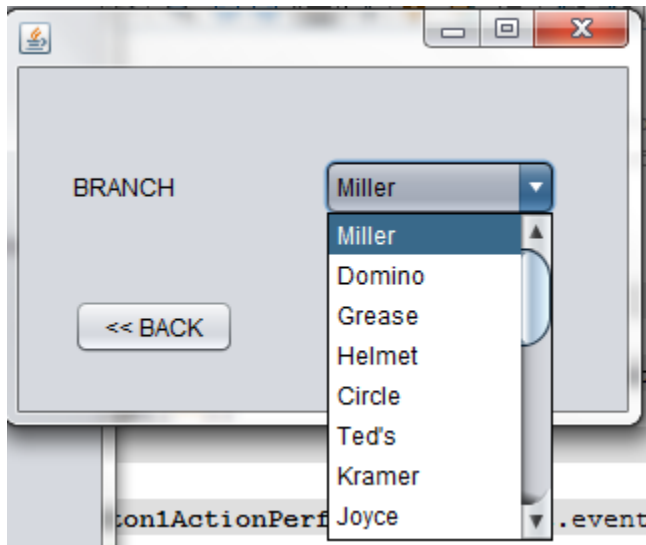
Well .. I chose Grease, we know branch id of it is 3. The following result was given :

SELECT readerid, count(*) AS count FROM borrow WHERE branchid = 3 GROUP BY readerid ORDER BY count DESC

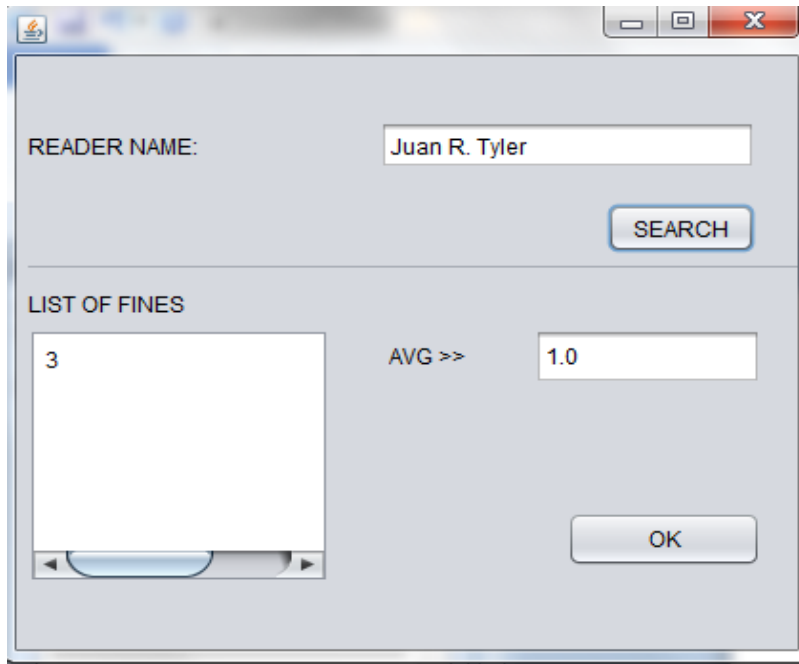| readerid	count
99029	2
89019	1
59813	1
82511	1
52026	1
89015	1

II. I. VI Print top 10 most borrowed books in a branch.

II. I. VII Find the average fine paid per reader.

Let's go with Juan R. Tyler readerid: 49811:

readerid	name	address	phone
49811	Juan R. Tyler	978 Lyndon Street Philadelphia PA 19103	9176841127

	bookid	readerid ▲	branchid	bdate	rdate	fine
☐ 🖉 Edit ⅔ⅈ Copy ⊖ Delete	130	42523	20	2013-03-03	2013-04-01	1.8
☐ 🖉 Edit ⅔ⅈ Copy ⊖ Delete	151	42523	13	2013-04-03	2013-04-23	0
☐ 🖉 Edit ⅔ⅈ Copy ⊖ Delet	2	49811	7	2013-02-24	2013-02-28	0
☐ 🖉 Edit ⅔ⅈ Copy ⊖ Delet	6	49811	9	2011-02-24	2011-03-31	3
☐ 🖉 Edit ⅔ⅈ Copy ⊖ Delet	3	49811	7	2013-04-28	NULL	0
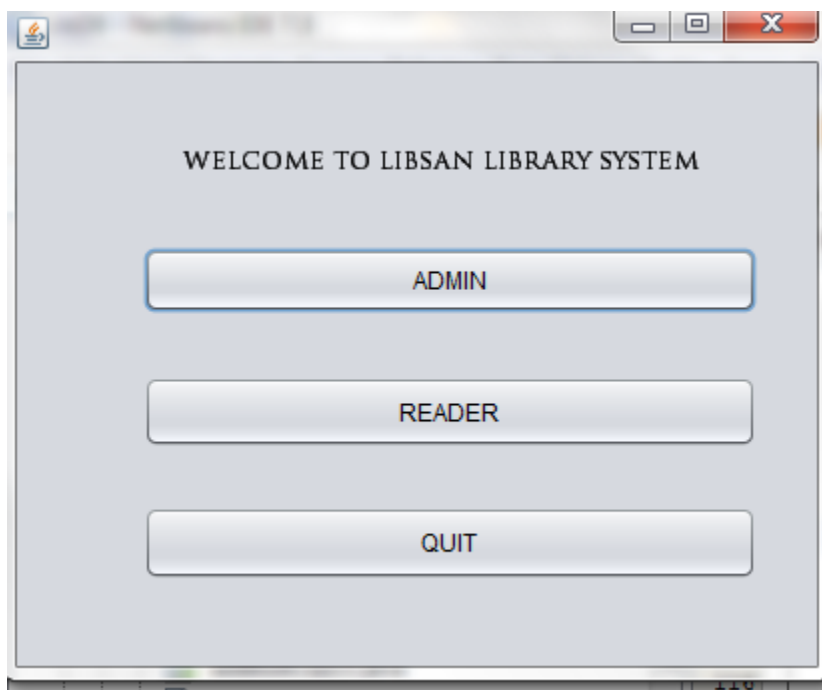
So, the history of Juan R. Tyler for his fine was 0, 3, and 0. Average should be 0+3+0 / 3 = 1

II. II. USER MENU

To be able to use the user menu functions you need to choose 'READER' section from the main menu.

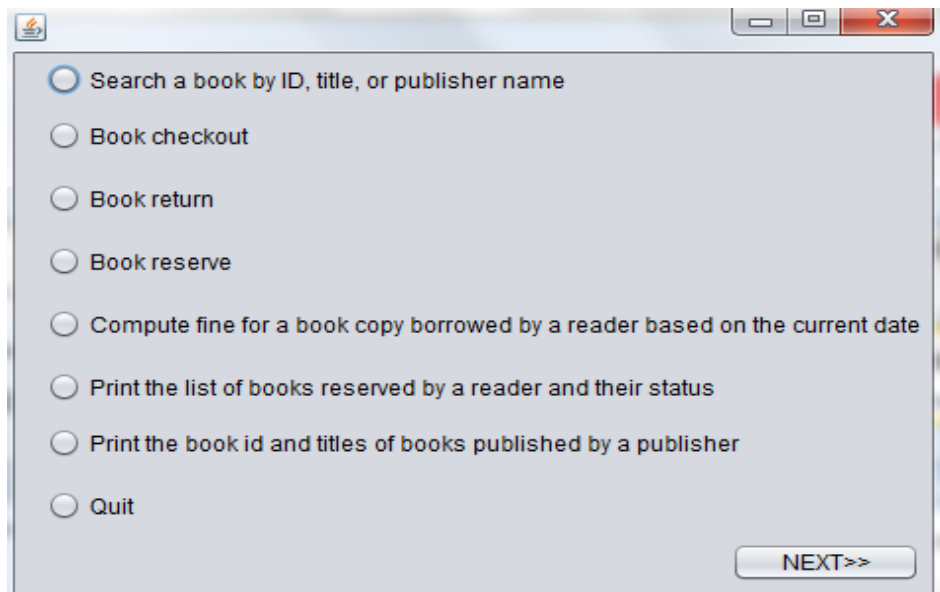Once you make the selection, the system wants you to enter your user id. It then goes to the reader table and checks if the given id is valid. If not;

| LOGIN ERROR | X |

(!) The user 70245 doesn't exist

OK
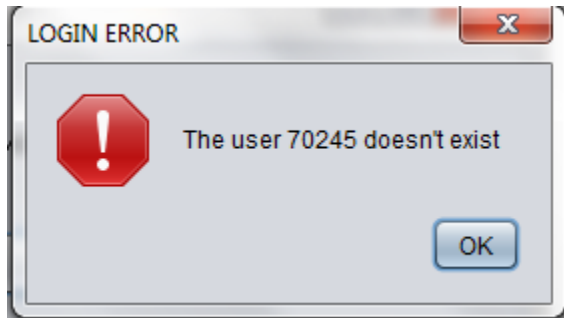
It won't let you in.
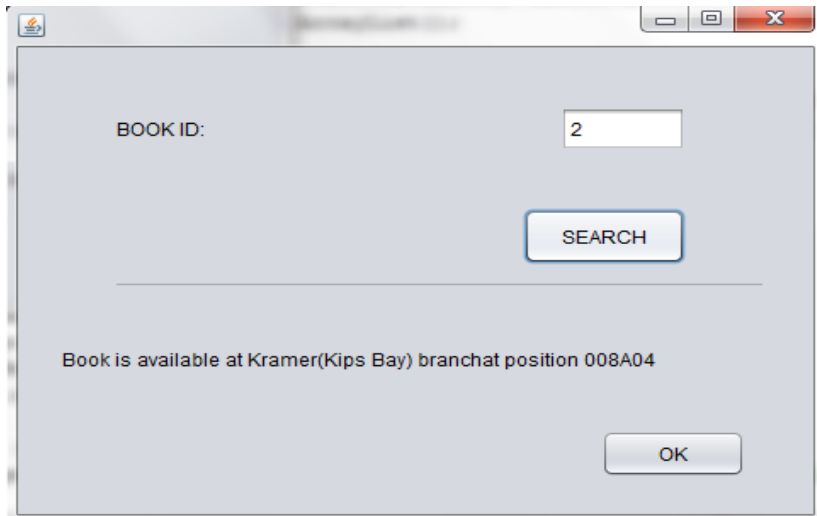
Once you enter the system with your valid user id, the user related function menu will appear:
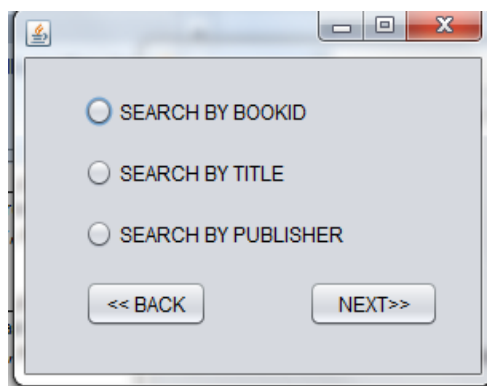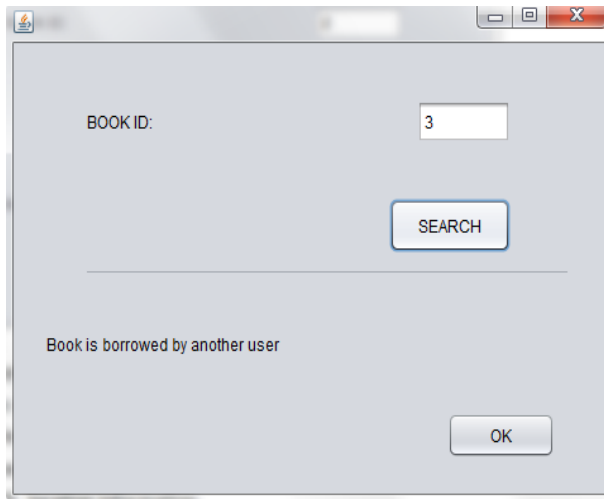
○ Search a book by ID, title, or publisher name

○ Book checkout

○ Book return

○ Book reserve

○ Compute fine for a book copy borrowed by a reader based on the current date

○ Print the list of books reserved by a reader and their status

○ Print the book id and titles of books published by a publisher

○ Quit

NEXT>>

II. II. I SEARCH A BOOK BY

○ SEARCH BY BOOKID

○ SEARCH BY TITLE

○ SEARCH BY PUBLISHER

<< BACK   NEXT>>

ID:

The system goes over the borrow table, checks if the bookid with '2' has return date as null, then goes over the reserve book if the book is reserved by someone in that day (I assumed the allowed length as a day not 6 hours.) If the system can't find the searched book in those conditions, then it goes through the location table and gets the branchid (then gets the name from branch table) with location information.

Other conditions:

TITLE:

Once you enter the title of the book and hit the search button it'll give you the information and the bookids of the copies of the searched book. Since you have the book ids of the book you want, you can do the search by book id.

TITLE: Look Back in Anger

SEARCH

TITLE: Look Back in Anger
ISBN: 004001
AUTHOR: John Osbourne
Book ID 71
Book ID 72
Book ID 73
Book ID 74
Book ID 91
Book ID 92
Book ID 93
Book ID 94

<< BACK   NEXT >>

Help

BOOK ID:

SEARCH

OK
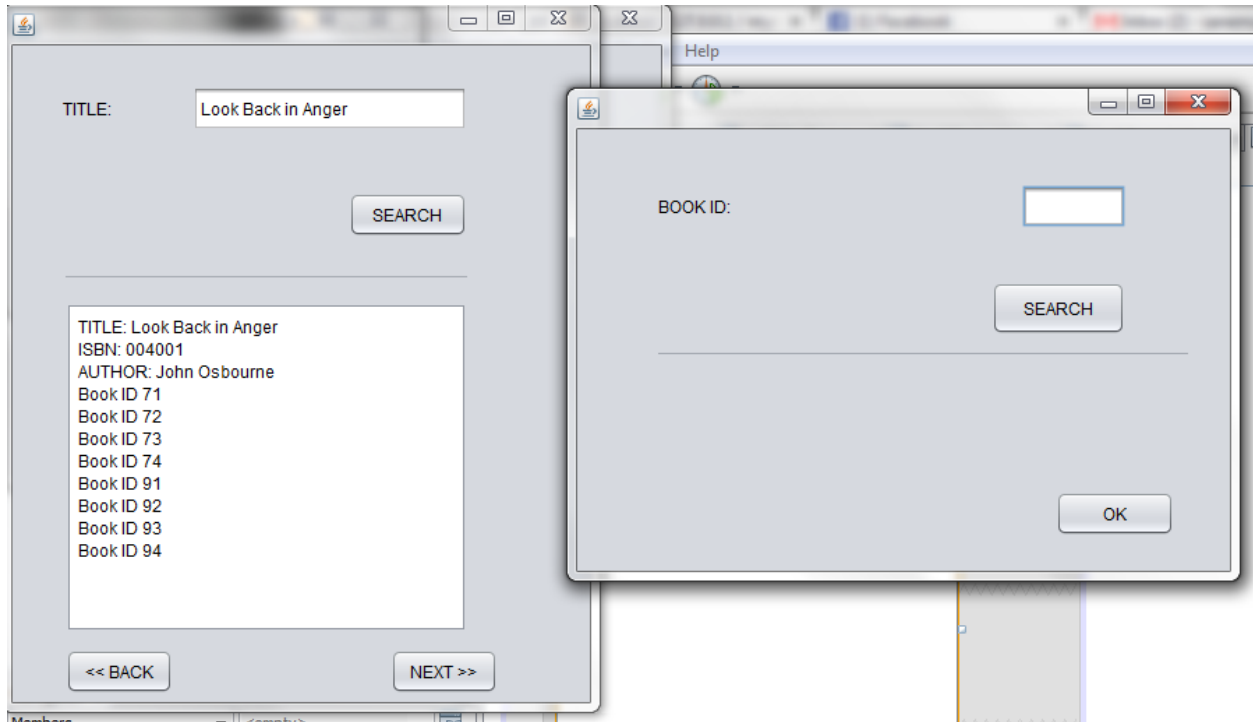
I just added one of the copies in reserve table with today's date:

readerid	bookid	date
52523	93	2013-05-02

And the result goes as the following:

BOOK ID: 93

SEARCH

Book is reserved by another user

OK
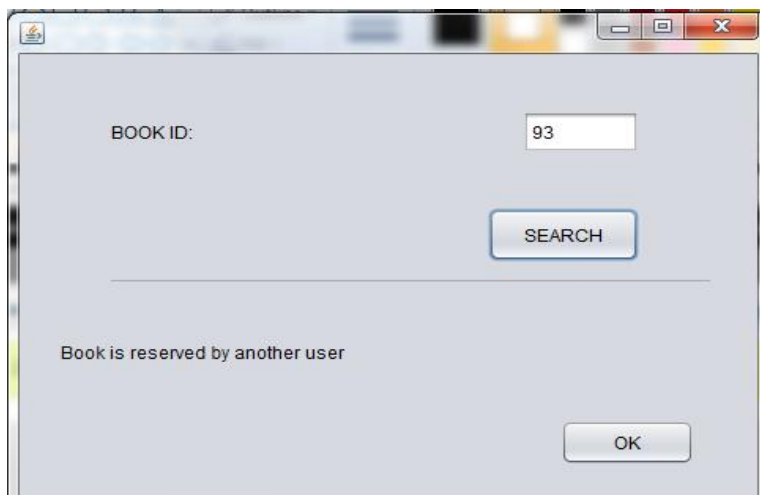
PUBLISHER:

You need to choose the publisher from the combobox and hit the search button to get the titles of the books published by the chosen publisher.
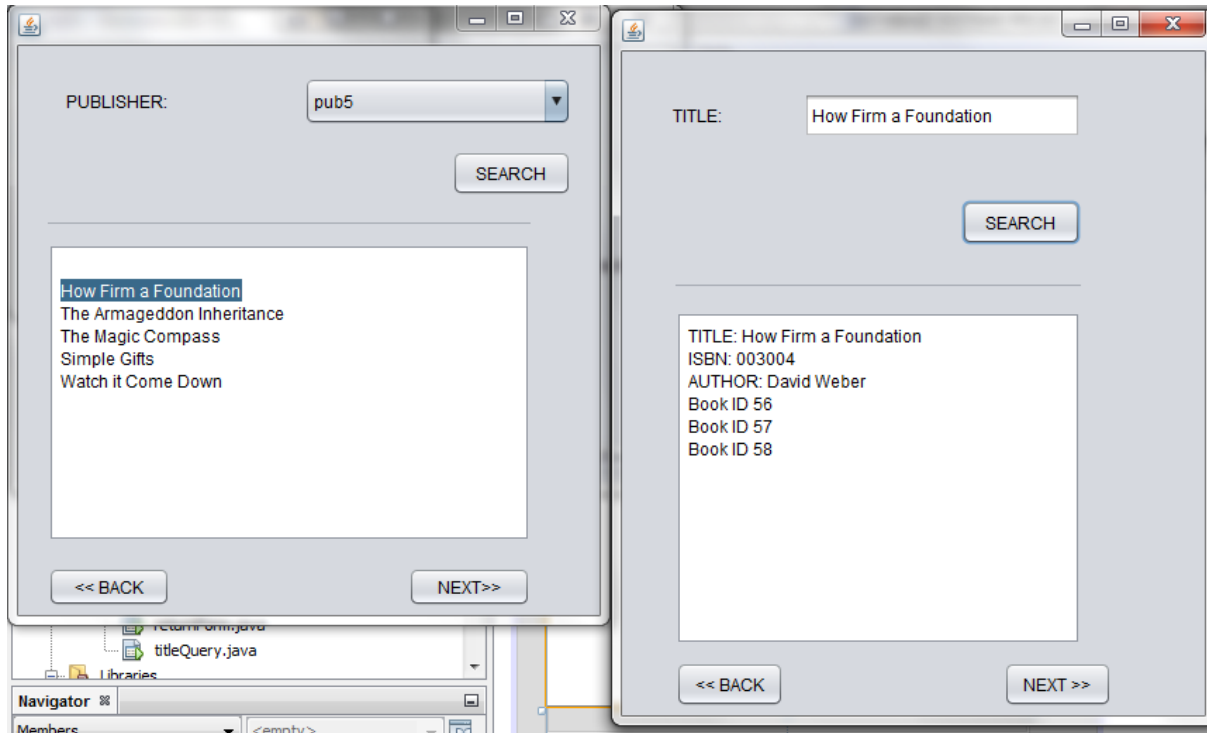
Once you click the NEXT button title search screen will appear and then you have to do the ones described in title search section.

II. II. II BOOK CHECKOUT

Assume that, you're at the branch Grease then you need to list the available books in that branch in the following screen.

Let's choose the book with id 139..

isbn	bookid
001004	1
001004	139
001004	186

isbn	title
001004	The Myth of Sisyphus

and hit the checkout button..
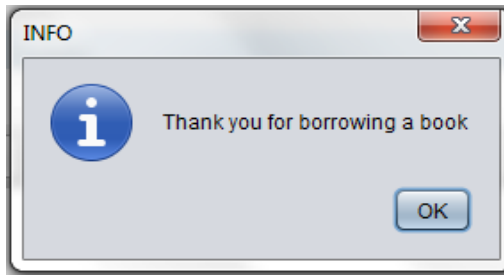
bookid	readerid ▾	branchid	bdate	rdate	fine
3	72014	7	2013-01-24	2013-03-05	2
13	72014	8	2013-03-20	NULL	0
17	72014	19	2013-03-24	2013-03-29	0
139	72014	3	2013-05-02	NULL	0

II. II. III BOOK RETURN

It'll search the borrow table and get the book ids that has return date as NULL for the logged user. I logged with user id 72014, let's look at the borrow table:

bookid	readerid ▲	branchid	bdate	rdate	fine
3	72014	7	2013-01-24	2013-03-05	2
13	72014	8	2013-04-24	NULL	0
17	72014	19	2013-03-24	2013-03-29	0

It seems only book 13 is not returned by this user, and let's see what the system gives:
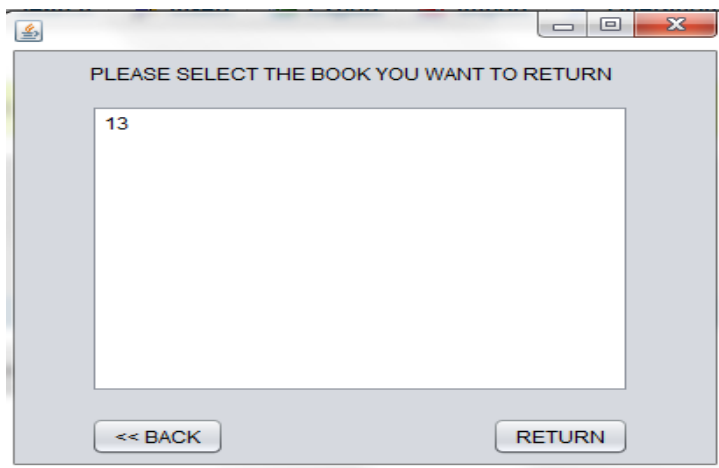
Well, it says we need to return book 13 too. So, return it!
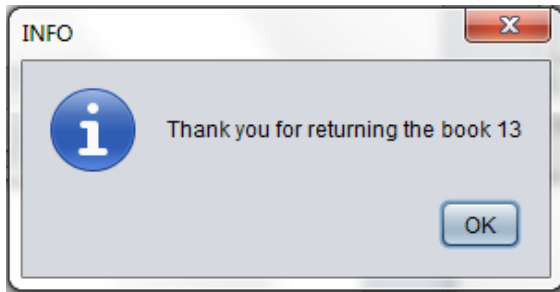
bookid	readerid ▲	branchid	bdate	rdate	fine
3	72014	7	2013-01-24	2013-03-05	2
13	72014	8	2013-04-24	2013-05-02	0
17	72014	19	2013-03-24	2013-03-29	0

II. II. IV BOOK RESERVE
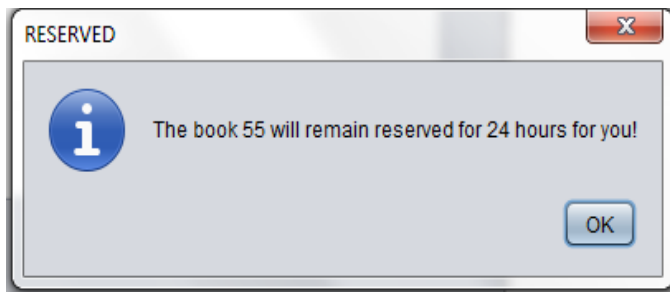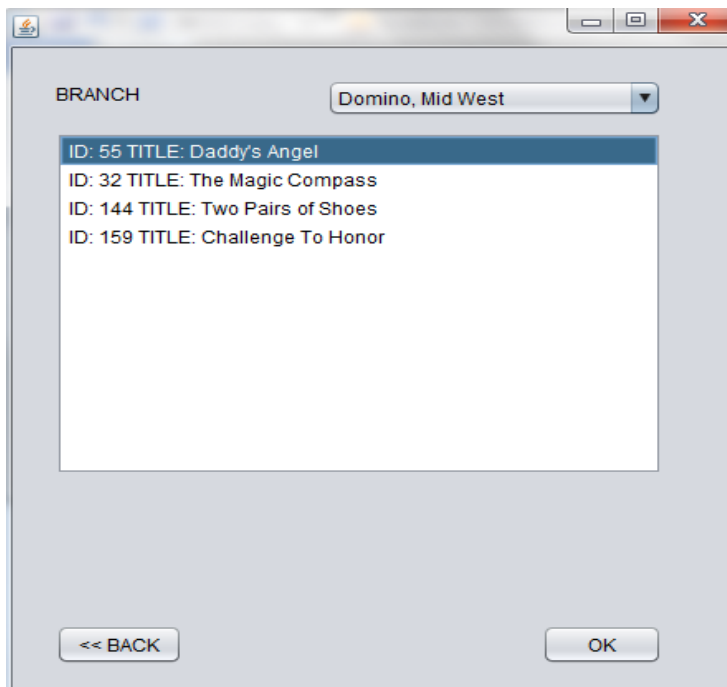
72014	55	2013-05-02

It is reserved, added to the reserve table.

II. II. V Compute fine for a book copy borrowed by a reader based on the current date.

I updated the borrow table for the user 72014 as the following:

bookid	readerid ▲	branchid	bdate	rdate	fine
3	72014	7	2013-01-24	2013-03-05	2
13	72014	8	2013-03-20	NULL	0
17	72014	19	2013-03-24	2013-03-29	0

So, the user has borrowed book 13 on 20th of March, 2013 and not returned yet. Today is May 2, 2013, the difference is 43 days which already extended 20 days for 23 day which makes the fine 23 * 0.2 = $4.6

Book ID | Borrow Date | Passed Day Count | Fine

13 | 2013-03-20 | 23 | 4.6

OK
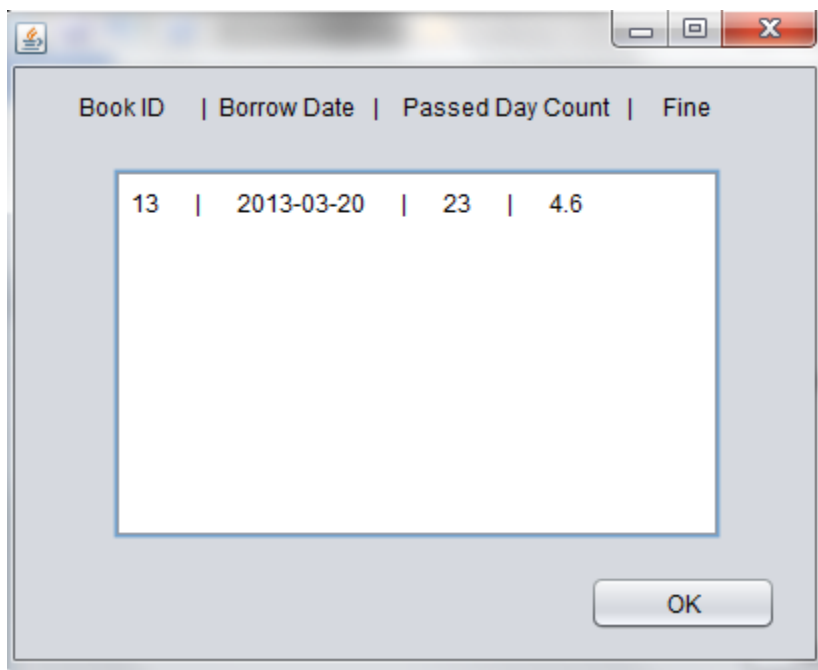
II. II. VI Print the list of book reserved by a reader and their status.

Here are the books once reserved by reader 72014:

readerid ▲	bookid	date
72014	2	2013-04-28
72014	3	2013-04-29
72014	4	2013-04-29
72014	54	2013-05-01
72014	55	2013-05-02
72014	135	2013-05-01

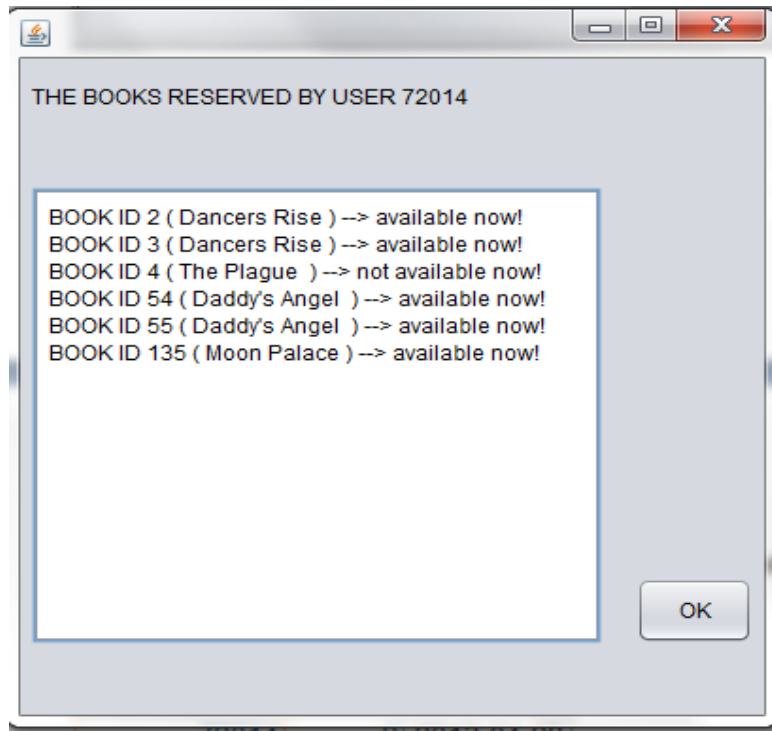Then the system goes through the both borrow & reserve tables for each book id and lists their situations as the following:

```
THE BOOKS RESERVED BY USER 72014


    BOOK ID 2 ( Dancers Rise ) --> available now!
    BOOK ID 3 ( Dancers Rise ) --> available now!
    BOOK ID 4 ( The Plague  ) --> not available now!
    BOOK ID 54 ( Daddy's Angel  ) --> available now!
    BOOK ID 55 ( Daddy's Angel  ) --> available now!
    BOOK ID 135 ( Moon Palace ) --> available now!



                                                OK
```

II. II. VII Print the book id and titles of books published by a publisher.

```
PUBLISHER        pub1            ▼

    << BACK              NEXT >>
```
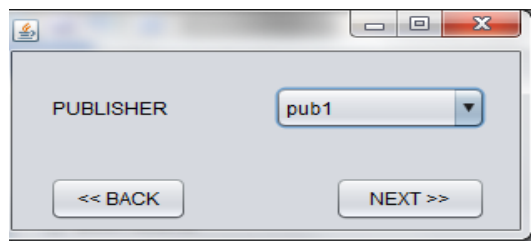
Once you select the publisher (I choose pub3 for this case) it gives you all the books with their ISBN and title.
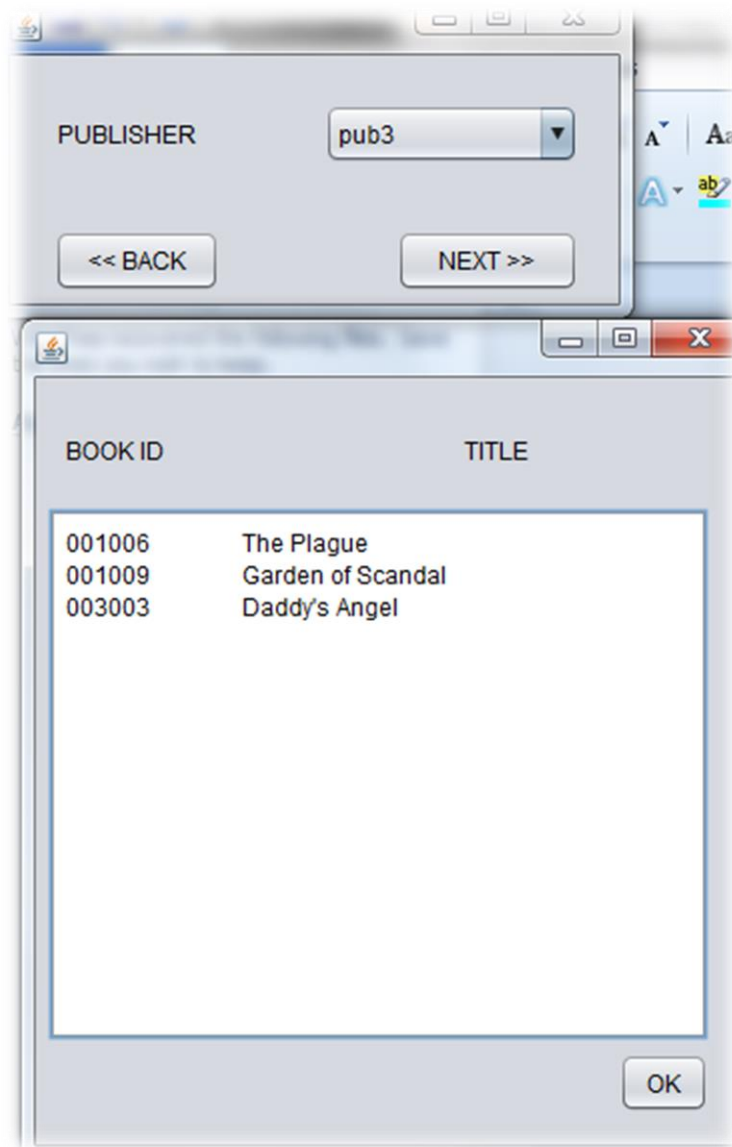
We can verify it by looking at the bookinfo table with publisherid = 3.

isbn	title	publisherid	publicationdate	authorid
001006	The Plague	3	2000-03-01	2
001009	Garden of Scandal	3	1987-05-06	1
003003	Daddy's Angel	3	1970-11-09	6

ERD

ADMIN
- Password
- Id

AUTHOR
- Author Id
- Name

READER
- Group Id
- Name

BORROW, RESERVE

COPY

HAS

M — M

WRITE
1 — 1

N

PUBLISHER
- Publisher Id
- Publisher Name
- Location

PUBLISH
M — 1

BOOK
- ISBN
- Title
- AuthorId
- PublisherId
- Publication Date