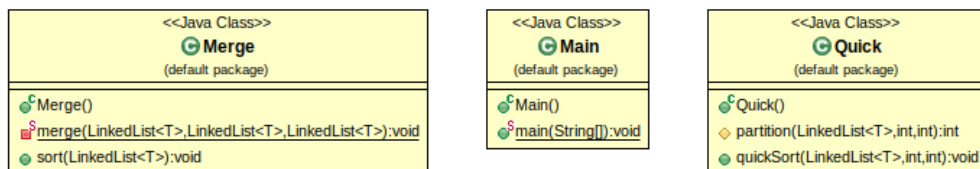


Question 2)

Problem Solution Approach

I thought that I will add linkedlist instead of arrays.

Class Diagram



Times

When I run the program with 100 and 10000 it is okay but 40000 is not okay in quick sort, because of the computer. So I did not do upper element sizes. In below pictures, times are in milliseconds.

Merge 10000

```
Time elapsed for 1. list <10000>: 340
Time elapsed for 2. list <10000>: 325
Time elapsed for 3. list <10000>: 316
Time elapsed for 4. list <10000>: 318
Time elapsed for 5. list <10000>: 288
Time elapsed for 6. list <10000>: 214
Time elapsed for 7. list <10000>: 235
Time elapsed for 8. list <10000>: 199
Time elapsed for 9. list <10000>: 201
Time elapsed for 10. list <10000>: 195
Time elapsed for 11. list <10000>: 207
Time elapsed for 12. list <10000>: 194
Time elapsed for 13. list <10000>: 196
Time elapsed for 14. list <10000>: 207
Time elapsed for 15. list <10000>: 193
Time elapsed for 16. list <10000>: 198
Time elapsed for 17. list <10000>: 198
Time elapsed for 18. list <10000>: 195
Time elapsed for 19. list <10000>: 199
Time elapsed for 20. list <10000>: 195

TOTAL = 4613
Sorted = 157
```

Merge 40000

```
Time elapsed for 1. list (40000): 5385
Time elapsed for 2. list (40000): 5859
Time elapsed for 3. list (40000): 6012
Time elapsed for 4. list (40000): 5799
Time elapsed for 5. list (40000): 5812
Time elapsed for 6. list (40000): 5482
Time elapsed for 7. list (40000): 5368
Time elapsed for 8. list (40000): 5527
Time elapsed for 9. list (40000): 5474
Time elapsed for 10. list (40000): 5353
Time elapsed for 11. list (40000): 5342
Time elapsed for 12. list (40000): 5272
Time elapsed for 13. list (40000): 5319
Time elapsed for 14. list (40000): 5321
Time elapsed for 15. list (40000): 5240
Time elapsed for 16. list (40000): 5299
Time elapsed for 17. list (40000): 5215
Time elapsed for 18. list (40000): 5481
Time elapsed for 19. list (40000): 5894
Time elapsed for 20. list (40000): 5307

TOTAL = 109761
Sorted = 4372
```

Quick 10000

```
Time elapsed for 1. list (10000): 3660
Time elapsed for 2. list (10000): 3838
Time elapsed for 3. list (10000): 3638
Time elapsed for 4. list (10000): 3568
Time elapsed for 5. list (10000): 3559
Time elapsed for 6. list (10000): 3829
Time elapsed for 7. list (10000): 3556
Time elapsed for 8. list (10000): 3779
Time elapsed for 9. list (10000): 3698
Time elapsed for 10. list (10000): 3747
Time elapsed for 11. list (10000): 3748
Time elapsed for 12. list (10000): 3497
Time elapsed for 13. list (10000): 3535
Time elapsed for 14. list (10000): 3486
Time elapsed for 15. list (10000): 3642
Time elapsed for 16. list (10000): 3577
Time elapsed for 17. list (10000): 2206
Time elapsed for 18. list (10000): 2534
Time elapsed for 19. list (10000): 2106
Time elapsed for 20. list (10000): 2078

TOTAL = 67281
```

Quick 40000

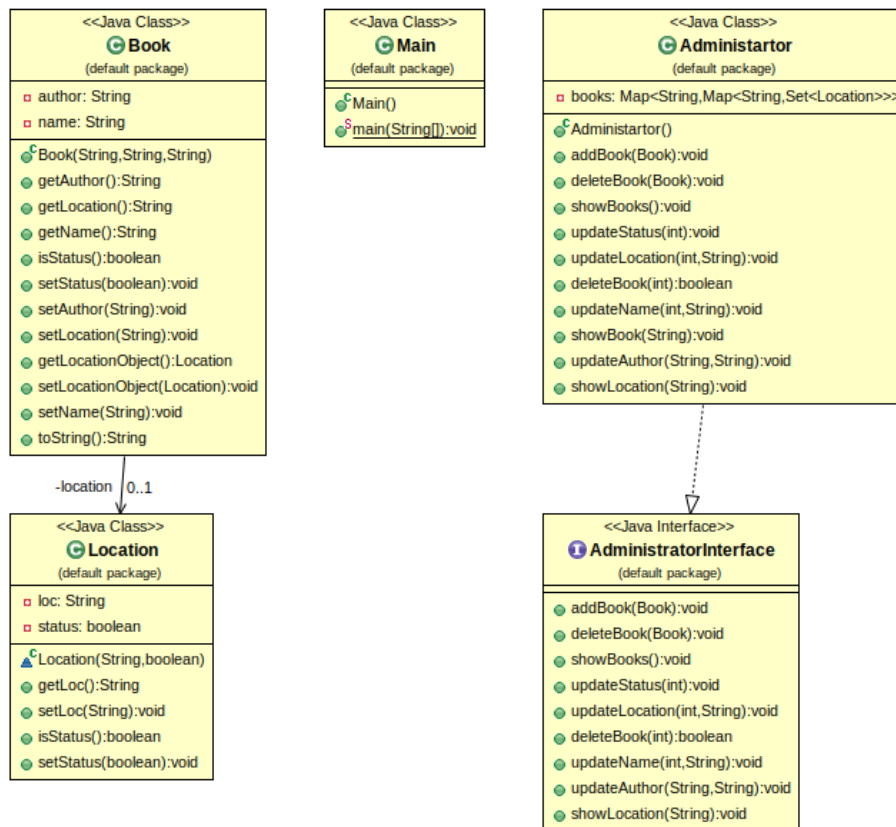
```
Time elapsed for 1. list <40000>: 63812
Time elapsed for 2. list <40000>: 64187
Time elapsed for 3. list <40000>: 56859
Time elapsed for 4. list <40000>: 79767
Time elapsed for 5. list <40000>: 48793
Time elapsed for 6. list <40000>: 59633
Time elapsed for 7. list <40000>: 54467
Time elapsed for 8. list <40000>: 49271
Time elapsed for 9. list <40000>: 48912
Time elapsed for 10. list <40000>: 49061
Time elapsed for 11. list <40000>: 62881
Time elapsed for 12. list <40000>: 122495
Time elapsed for 13. list <40000>: 148099
Time elapsed for 14. list <40000>: 105889
Time elapsed for 15. list <40000>: 120083
Time elapsed for 16. list <40000>: 110602
Time elapsed for 17. list <40000>: 122056
Time elapsed for 18. list <40000>: 119624
```

Question 3)

Problem Solution Approach

In this problem, I thought that there will be map that has another map and the another map is also has a set. Then I create this map field and I did all operations in this field. There is no place to keep status, I create a location class to keep location and status at the same time. Then I determine a general password that is "1234". Thanks to it, Admin can enter the system with this password. I thought this way and I wrote the classes.

Class Diagram



Test Cases

	Task	Parameter	Expected Result	Pass or not
1)	Add Book	Book	Should add	Pass
2)	Add same book	Book	Should add	Pass
3)	Delete Book	Int booknumber	Should delete	Pass
4)	Show Book with author	String author	Should show	Pass
5)	Show Book with book title	String name	Should show	Pass
6)	Update Status a book	Int book number	Should update	Pass

Results

1)
Welcome to Library System

Choose one of them to continue
1 : Enter the system as a Administrator
2 : Search book by author name
3 : Search book by title
0 : Exit

1
Enter password
1234

1 : Add Book
2 : Delete Book
3 : Update Information

1
Enter Author :
mustafa tokgöz
Enter Title :
cse 222
Enter Shelf :
5
Enter Corridor :
3
3
Enter book name
cse 222
Author Name : mustafa tokgöz
Title : cse 222
Locations are :
c3s5.153 Status : available

Choose one of them to continue
1 : Enter the system as a Administrator
2 : Search book by author name
3 : Search book by title
0 : Exit

2)
Welcome to Library System

Choose one of them to continue
1 : Enter the system as a Administrator
2 : Search book by author name
3 : Search book by title
0 : Exit

1
Enter password
1234

1 : Add Book
2 : Delete Book
3 : Update Information

1
Enter Author :
mustafa tokgöz
Enter Title :
cse 222
Enter Shelf :
5
Enter Corridor :

3

Choose one of them to continue
1 : Enter the system as a Administrator
2 : Search book by author name
3 : Search book by title
0 : Exit

1

Enter password
1234

1 : Add Book
2 : Delete Book
3 : Update Information

1

Enter Author :

mustafa tokgöz

Enter Title :

cse 222

Enter Shelf :

6

Enter Corridor :

4

Choose one of them to continue
1 : Enter the system as a Administrator
2 : Search book by author name
3 : Search book by title
0 : Exit

3

Enter book name

cse 222

Author Name : mustafa tokgöz

Title : cse 222

Locations are :

c3s5.157 Status : available

c4s6.1108 Status : available

Choose one of them to continue
1 : Enter the system as a Administrator
2 : Search book by author name
3 : Search book by title
0 : Exit

3)

Welcome to Library System

Choose one of them to continue
1 : Enter the system as a Administrator
2 : Search book by author name
3 : Search book by title
0 : Exit

1

Enter password
1234

1 : Add Book
2 : Delete Book

3 : Update Information

1

Enter Author :

mustafa tokgöz

Enter Title :

cse 222

Enter Shelf :

5

Enter Corridor :

4

Choose one of them to continue

1 : Enter the system as a Administrator

2 : Search book by author name

3 : Search book by title

0 : Exit

1

Enter password

1234

1 : Add Book

2 : Delete Book

3 : Update Information

1

Enter Author :

mustafa tokgöz

Enter Title :

cse 222

Enter Shelf :

3

Enter Corridor :

1

Choose one of them to continue

1 : Enter the system as a Administrator

2 : Search book by author name

3 : Search book by title

0 : Exit

1

Enter password

1234

1 : Add Book

2 : Delete Book

3 : Update Information

2

Select a book to delete

Author Name : mustafa tokgöz

Name of the book is :cse 222

Locations are :

1 . c4s5.2017 Status : available

2 . cls3.1319 Status : available

1

Choose one of them to continue

1 : Enter the system as a Administrator

2 : Search book by author name

3 : Search book by title

0 : Exit

3

Enter book name

cse 222

Author Name : mustafa tokgöz

Title : cse 222

Locations are :

cls3.1319 Status : available

Choose one of them to continue

1 : Enter the system as a Administrator

2 : Search book by author name

3 : Search book by title

0 : Exit

4)

Choose one of them to continue

1 : Enter the system as a Administrator

2 : Search book by author name

3 : Search book by title

0 : Exit

2

Enter author name

mustafa tokgöz

Author Name : mustafa tokgöz

1 . cse 222

Select one of book

1

Locations are :

cls3.1319 Status : available

Choose one of them to continue

1 : Enter the system as a Administrator

2 : Search book by author name

3 : Search book by title

0 : Exit

5)

Choose one of them to continue

1 : Enter the system as a Administrator

2 : Search book by author name

3 : Search book by title

0 : Exit

3

Enter book name

cse 222

Author Name : mustafa tokgöz

Title : cse 222

Locations are :

cls3.1319 Status : available

Choose one of them to continue

1 : Enter the system as a Administrator

2 : Search book by author name

3 : Search book by title

0 : Exit

6)

Enter book name

cse 222

Author Name : mustafa tokgöz

Title : cse 222

Locations are :

cls3.1319 Status : available

Choose one of them to continue

1 : Enter the system as a Administrator

2 : Search book by author name

3 : Search book by title

0 : Exit

1

Enter password

1234

1 : Add Book

2 : Delete Book

3 : Update Information

3

1 : Update Author

2 : Update Title

3 : Update Location

4 : Update Status

4

Author Name : mustafa tokgöz

Name of the book is :cse 222

Locations are :

1 . cls3.1319 Status : available

Enter number of the book

1

Choose one of them to continue

1 : Enter the system as a Administrator

2 : Search book by author name

3 : Search book by title

0 : Exit

3

Enter book name

cse 222

Author Name : mustafa tokgöz

Title : cse 222

Locations are :

cls3.1319 Status : not available

Choose one of them to continue

1 : Enter the system as a Administrator

2 : Search book by author name

3 : Search book by title

0 : Exit

Mustafa Tokgöz