

GTU Department of Computer Engineering
CSE 222/505 - Spring 2023
Homework 3 – Report
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Running command and results

Basic Array Structure:

TestClass1:

```
erkut@erkut:~/Desktop/1801042646/Array$ java Array.TestClass1
... Creating accounts...
An account with username gizemsungu has been created.
An account with username sibelgulmez has been created.
An account with username gokhankaya has been created.
Logging into an account (username:sibelgulmez)...
Sharing two posts...
Following gizemsungu and gokhankaya...
Logging out from account (username:sibelgulmez)...
Logging into an account (username:gokhankaya)...
Viewing sibelgulmez's profile...
User ID: 2
Username: sibelgulmez
Location: Ankara
Birth Date: 14.01.1994
sibelgulmez is following 2 account(s) and has 0 follower(s).
The followers of sibelgulmez are:
sibelgulmez is following: gizemsungu,gokhankaya,
sibelgulmez has 2 posts.
You are blocked!
Viewing sibelgulmez's posts...
(PostID: 1) sibelgulmez: I like Java...
(PostID: 2) sibelgulmez: Java the coffee...
Liking a post of sibelgulmez...
Adding a comment on a post of sibelgulmez...
Following sibelgulmez and gizemsungu...
Sending a message to gizemsungu...
Logging out from account (username:gokhankaya)...
Logging into an account (username:gizemsungu)...
Checking outbox...
There is/are 0 message(s) in the outbox.
Checking inbox...
There is/are 1 message(s) in the inbox.
Viewing inbox...
Message ID: 0
From: gokhankaya
To: gizemsungu
Message: This homework is too easy!

Viewing sibelgulmez's profile...
User ID: 2
Username: sibelgulmez
Location: Ankara
Birth Date: 14.01.1994
sibelgulmez is following 2 account(s) and has 1 follower(s).
The followers of sibelgulmez are: gokhankaya,
sibelgulmez is following: gizemsungu,gokhankaya,
sibelgulmez has 2 posts.
You are blocked!
Viewing sibelgulmez's posts...
(PostID: 1) sibelgulmez: I like Java...
(PostID: 2) sibelgulmez: Java the coffee...
-----
Viewing sibelgulmez's posts' interactions...
```

```

-----
Viewing sibelgulmez's posts' interactions...
(PostID: 1): I like Java...
The post was liked by the following account(s): gokhankaya,
The post has 1 comment(s)...
Comment 1: 'gokhankaya' said 'me too!'
(PostID: 2): Java the coffee...
The post was liked by the following account(s):
The post has 0 comment(s)...

Liking sibelgulmez's posts...
-----
Viewing sibelgulmez's posts' interactions...
(PostID: 1): I like Java...
The post was liked by the following account(s): gokhankaya,gizemsungu,
The post has 1 comment(s)...
Comment 1: 'gokhankaya' said 'me too!'
(PostID: 2): Java the coffee...
The post was liked by the following account(s): gizemsungu,
The post has 0 comment(s)...

77529234

```

TestClass2:

Running command:

```

erkut@erkut:~/Desktop/1801042646/Array$ java Array.TestClass2
... Creating accounts...
An account with username gizemsungu has been created.
An account with username sibelgulmez has been created.
An account with username gokhankaya has been created.
Logging into an account (username:sibelgulmez)...
Sharing two posts...
Following gizemsungu and gokhankaya...

```

Result:

```

Logging into an account (username:gizemsungu)...
Logging out from account (username:gizemsungu)...
Logging into an account (username:sibelgulmez)...
User ID: 1
Username: gizemsungu
Location: Istanbul
Birth Date: 13.01.1993
gizemsungu is following 0 account(s) and has 2 follower(s).
The followers of gizemsungu are: sibelgulmez,gokhankaya,
gizemsungu is following:
gizemsungu has 2 posts.
You are blocked!
Logging out from account (username:sibelgulmez)...
Logging into an account (username:gokhankaya)...
User ID: 1
Username: gizemsungu
Location: Istanbul
Birth Date: 13.01.1993
gizemsungu is following 0 account(s) and has 2 follower(s).
The followers of gizemsungu are: sibelgulmez,gokhankaya,
gizemsungu is following:
gizemsungu has 2 posts.
You are blocked!
Logging out from account (username:gokhankaya)...
Logging into an account (username:gizemsungu)...
Message ID: 0
From: gokhankaya
To: gizemsungu
Message: This homework is too easy!

Message ID: 1
From: gokhankaya
To: gizemsungu
Message: Hello!

80859563

```

TestClass3:

Running Command:

```
erkut@erkut:~/Desktop/1801042646/Array$ java Array.TestClass3
... Creating accounts...
An account with username gizemsungu has been created.
An account with username sibelgulmez has been created.
An account with username gokhankaya has been created.
Logging into an account (username:sibelgulmez)...
Sharing two posts...
Following gizemsungu and gokhankaya...
```

Result:

```
gizemsungu logs in...
Logging into an account (username:gizemsungu)...
blocks sibelgulmez...
gizemsungu logs out...
sibelgulmez logs in...
Logging into an account (username:sibelgulmez)...
tries to view the profile of gizemsungu...
You are blocked!
tries to send a message to gizemsungu...
You are blocked from this account you can't send a message.
Logging out from account (username:sibelgulmez)...
78121344
erkut@erkut:~/Desktop/1801042646/Array$
```

Array List Structure:

TestClass1:

```
erkut@erkut:~/Desktop/1801042646/ArrayList$ java ArrayList.TestClass1
... Creating accounts...
An account with username gizemsungu has been created.
An account with username sibelgulmez has been created.
An account with username gokhankaya has been created.
Logging into an account (username:sibelgulmez)...
Sharing two posts...
Following gizemsungu and gokhankaya...
Logging out from account (username:sibelgulmez)...
Logging into an account (username:gokhankaya)...
Viewing sibelgulmez's profile...
User ID: 2
Username: sibelgulmez
Location: Ankara
Birth Date: 14.01.1994
sibelgulmez is following 2 account(s) and has 0 follower(s).
The followers of sibelgulmez are:
sibelgulmez is following: gizemsungu,gokhankaya,
sibelgulmez has 2 posts.
Viewing sibelgulmez's posts...
(PostID: 1) sibelgulmez: I like Java...
(PostID: 2) sibelgulmez: Java the coffee...
Liking a post of sibelgulmez...
Adding a comment on a post of sibelgulmez...
Following sibelgulmez and gizemsungu...
Sending a message to gizemsungu...
Logging out from account (username:gokhankaya)...
Logging into an account (username:gizemsungu)...
Checking outbox...
There is/are 0 message(s) in the outbox.
Checking inbox...
There is/are 1 message(s) in the inbox.
Viewing inbox...
Message ID: 0
From: gokhankaya
To: gizemsungu
Message: This homework is too easy!

Viewing sibelgulmez's profile...
User ID: 2
Username: sibelgulmez
Location: Ankara
Birth Date: 14.01.1994
sibelgulmez is following 2 account(s) and has 1 follower(s).
The followers of sibelgulmez are: gokhankaya,
sibelgulmez is following: gizemsungu,gokhankaya,
sibelgulmez has 2 posts.
Viewing sibelgulmez's posts...
(PostID: 1) sibelgulmez: I like Java...
(PostID: 2) sibelgulmez: Java the coffee...
-----
Viewing sibelgulmez's posts' interactions...
(PostID: 1): I like Java...
The post was liked by the following account(s): gokhankaya,
The post has 1 comment(s)...
Comment 1: gokhankaya said like post!!
```

```

.....
Viewing sibelgulmez's posts' interactions...
(PostID: 1): I like Java...
The post was liked by the following account(s): gokhankaya,
The post has 1 comment(s)...
Comment 1: 'gokhankaya' said 'me too!'
(PostID: 2): Java the coffee...
The post was liked by the following account(s):
The post has 0 comment(s)...

Liking sibelgulmez's posts...
-----
Viewing sibelgulmez's posts' interactions...
(PostID: 1): I like Java...
The post was liked by the following account(s): gokhankaya,gizemsungu,
The post has 1 comment(s)...
Comment 1: 'gokhankaya' said 'me too!'
(PostID: 2): Java the coffee...
The post was liked by the following account(s): gizemsungu,
The post has 0 comment(s)...

79671509
erkut@erkut:~/Desktop/1801042646/ArrayList$ 

```

TestClass2:

```

erkut@erkut:~/Desktop/1801042646/ArrayList$ java ArrayList.TestClass2
... Creating accounts...
An account with username gizemsungu has been created.
An account with username sibelgulmez has been created.
An account with username gokhankaya has been created.
Logging into an account (username:sibelgulmez)...
Sharing two posts...
Following gizemsungu and gokhankaya...
Logging out from account (username:sibelgulmez)...
Logging into an account (username:gokhankaya)...
Viewing sibelgulmez's profile...
User ID: 2
Username: sibelgulmez
Location: Ankara
Birth Date: 14.01.1994
sibelgulmez is following 2 account(s) and has 0 follower(s).
The followers of sibelgulmez are:
sibelgulmez is following: gizemsungu,gokhankaya,
sibelgulmez has 2 posts.
Viewing sibelgulmez'posts...

```

```
Logging into an account (username:gizemsungu)...
Logging out from account (username:gizemsungu)...
Logging into an account (username:sibelgulmez)...
User ID: 1
Username: gizemsungu
Location: Istanbul
Birth Date: 13.01.1993
gizemsungu is following 0 account(s) and has 2 follower(s).
The followers of gizemsungu are: sibelgulmez,gokhankaya,
gizemsungu is following:
gizemsungu has 2 posts.
Logging out from account (username:sibelgulmez)...
Logging into an account (username:gokhankaya)...
User ID: 1
Username: gizemsungu
Location: Istanbul
Birth Date: 13.01.1993
gizemsungu is following 0 account(s) and has 2 follower(s).
The followers of gizemsungu are: sibelgulmez,gokhankaya,
gizemsungu is following:
gizemsungu has 2 posts.
Logging out from account (username:gokhankaya)...
Logging into an account (username:gizemsungu)...
Message ID: 0
From: gokhankaya
To: gizemsungu
Message: This homework is too easy!

Message ID: 1
From: gokhankaya
To: gizemsungu
Message: Hello!

78333366
erkut@erkut:~/Desktop/1801042646/ArrayList$
```


TestClass3:

```
erkut@erkut:~/Desktop/1801042646/ArrayList$ java ArrayList.TestClass3
... Creating accounts...
An account with username gizemsungu has been created.
An account with username sibelgulmez has been created.
An account with username gokhankaya has been created.
Logging into an account (username:sibelgulmez)...
Sharing two posts...
Following gizemsungu and gokhankaya...
Logging out from account (username:sibelgulmez)...
Logging into an account (username:gokhankaya)...
Viewing sibelgulmez's profile...
User ID: 2
Username: sibelgulmez
Location: Ankara
Birth Date: 14.01.1994
sibelgulmez is following 2 account(s) and has 0 follower(s).
The followers of sibelgulmez are:
```

```
gizemsungu logs in...
Logging into an account (username:gizemsungu)...
blocks sibelgulmez...
gizemsungu logs out...
sibelgulmez logs in...
Logging into an account (username:sibelgulmez)...
tries to view the profile of gizemsungu...
You are blocked!
tries to send a message to gizemsungu...
You are blocked from this account you can't send a message.
Logging out from account (username:sibelgulmez)...
83102962
erkut@erkut:~/Desktop/1801042646/ArrayList$
```

TestClass4:

```
erkut@erkut:~/Desktop/1801042646/ArrayList$ java ArrayList.TestClass4
... Creating accounts...
An account with username gizemsungu has been created.
An account with username sibelgulmez has been created.
An account with username gokhankaya has been created.
An account with username mehmetoz has been created.
An account with username paulnewman has been created.
An account with username jenniferowen has been created.
An account with username sarahpaulson has been created.
An account with username minlee has been created.
An account with username josephlawson has been created.
An account with username harperlee has been created.
Logging into an account (username:sibelgulmez)...
Logging out from account (username:sibelgulmez)...
Logging into an account (username:gokhankaya)...
0
1
-----
Comment 1 'gokhankaya said 'me too!'
1
There is no comments on this post
0
(PostID: 1): I like Java...
The post was liked by the following account(s): gokhankaya,
The post has 0 comment(s)...
(PostID: 2): Java the coffee...
The post was liked by the following account(s):
The post has 0 comment(s)...

User ID: 2
Username: sibelgulmez
Location: Ankara
Birth Date: 14.01.1994
sibelgulmez is following 1 account(s) and has 0 follower(s).
The followers of sibelgulmez are:
sibelgulmez is following: gokhankaya,
sibelgulmez has 2 posts.
Logging out from account (username:gokhankaya)...
Logging into an account (username:mehmetoz)...
(PostID: 1): I like Java...
The post was liked by the following account(s): gokhankaya,mehmetoz,
The post has 1 comment(s)...
Comment 1: 'mehmetoz' said 'Very nice post!'
(PostID: 2): Java the coffee...
The post was liked by the following account(s):
The post has 0 comment(s)...

80350234
erkut@erkut:~/Desktop/1801042646/ArrayList$
```


Experimental running time analysis (with the table):

Implementation Type	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Basic Array Structure (HW1)	77529234 ns	80859563 ns	78121344 ns	Not available
Array List Structure (a)	79671509 ns	78333366 ns	83102962 ns	80350234 ns
Linked List Structure (b)	-	-	-	-
LD Linked List Structure (c)	-	-	-	-

“-” means: not implemented

Time complexity analysis

Basic Array Structure:

View methods:

```
/**
 *
 * @param account
 * This method used for viewing Post of an account
 */
public void viewPosts(Account account) {
    int blockFlag = 0;
    for (int i = 0; i < account.numBlockedAccounts; ++i) {
        if (account.blockedAccounts[i].accountId == this.accountId) {
            blockFlag = 1;
        }
    }
    if (blockFlag == 0) {
        for (int i = 0; i < account.numPosts; i++) {
            System.out.println("(PostID: " + account.getPost()[i].getId() + ") " + " " + account.username + ": "
                + account.posts[i].getContent());
        }
    }
}
```

Most of the view methods includes loops so that this methods must have $O(n)$ time complexity, In this example (viewPosts) we have two loops but the first loop is not dependent on the number of posts in the account object, so the time complexity is:

$O(n)$ where $n = \text{account.numPosts}$.

```

public void viewPostInteraction(Account a) {
    int blockFlag = 0;
    for (int i = 0; i < a.numBlockedAccounts; ++i) {
        if (a.blockedAccounts[i].accountId == this.accountId) {
            blockFlag = 1;
        }
    }

    if (blockFlag == 0) {
        for (int i = 0; i < a.numPosts; i++) {
            System.out.println("PostID: " + a.getPost()[i].getId() + ": " + a.getPost()[i].getContent() + "");
            System.out.print("The post was liked by the following account(s): ");
            for (int j = 0; j < a.getPost()[i].getLikeCount(); j++) {
                System.out.print(a.getPost()[i].getLikes()[j].likeOwner().getUserName() + ",");
            }
            System.out.println("");
            System.out.println("The post has " + a.getPost()[i].getCommentCount() + " comment(s)...");

            for (int j = 0; j < a.getPost()[i].getCommentCount(); j++) {
                System.out.println("Comment " + a.getPost()[i].getCommentCount() + ": " +
                    a.getPost()[i].getComments()[j].getUsername() + " said " +
                    a.getPost()[i].getComments()[j].getContent() + "");
            }
        }
        System.out.println("");
    }
}

```

In this example the time complexity is: $O(n^2)$

Add methods:

Here is an example of one of my add methods. Here I have helper variable (numPosts) which is incremented every time. So I don't have to use loops to get to end of an array.

This type of methods have $O(1)$ time complexity.

```

public void addPost(Post post) {
    if (numPosts < 100) {
        posts[numPosts++] = post;
    }
}

```

Array List Structure:

Get Methods:

These methods have $O(1)$ time complexity.

View Methods:

View methods' time complexity are similar with the basic array structure one which is $O(n)$, most of the time. In some situations I have to use nested loops, in those situations we have $O(n^2)$ time complexity.

Add Methods:

Add methods also have $O(1)$ constant time complexity similarly with basic array structure.

Remove Methods:

Some of the methods includes remove method, this methods have the time complexity of $O(n)$ where n is the dependent of the size of the Array List object's size. Here is the example of one of the remove method:

```

/**
 * This method removes unfollowed accounts from the account's followers
 * ArrayList
 *
 * @param account
 */
public void removeFollower(Account account) {
    if (followers.size() > 0) {
        followers.remove(account);
    }
}

```