

GEBZE TECHNICAL UNIVERSITY COMPUTER SCIENCE AND
ENGINEERING DEPARTMENT

CSE 222 / 2023 SPRING

HOMEWORK 3 REPORT

ETHEM MENGAASLAN

200104004016

Test & Output:

Creating Accounts:

```
System.out.println("Creating Accounts...");
System.out.println("");

Account sibelgulmez = new Account( userid: 1, uname: "sibelgulmez", ubirthdate: "01.01.1999", ulocation: "Darica");
Account gokhankaya = new Account( userid: 2, uname: "gokhankaya", ubirthdate: "03.05.1988", ulocation: "Tuzla");
Account gizemsungu = new Account( userid: 3, uname: "gizemsungu", ubirthdate: "05.06.1998", ulocation: "Pendik");
Account ysa = new Account( userid: 4, uname: "ysa", ubirthdate: "23.10.1971", ulocation: "Houston");
Account mehmetG = new Account( userid: 5, uname: "mehmetG", ubirthdate: "21.11.1974", ulocation: "Dubai");
Account yakupG = new Account( userid: 6, uname: "yakupG", ubirthdate: "13.09.3047", ulocation: "Planet G-4723");
Account abdurrahman = new Account( userid: 7, uname: "abdurrahman", ubirthdate: "05.06.1988", ulocation: "Kartal");
Account ethem = new Account( userid: 8, uname: "ethem", ubirthdate: "15.07.2002", ulocation: "Gtu Library");
Account enesss = new Account( userid: 9, uname: "enesss", ubirthdate: "01.06.2000", ulocation: "Dudullu");
Account reveha = new Account( userid: 10, uname: "reveha", ubirthdate: "02.09.2001", ulocation: "Cayirova");
Account habilK = new Account( userid: 11, uname: "habilK", ubirthdate: "05.06.1986", ulocation: "Texas");
```

Creating Accounts...

```
An account with name sibelgulmez has been created
An account with name gokhankaya has been created
An account with name gizemsungu has been created
An account with name ysa has been created
An account with name mehmetG has been created
An account with name yakupG has been created
An account with name abdurrahman has been created
An account with name ethem has been created
An account with name enesss has been created
An account with name reveha has been created
An account with name habilK has been created
```

Account ysa doing activity:

```
ysa.login();
ysa.followAccount(mehmetG);
ysa.followAccount(yakupG);

ysa.sharePost( content: "I have a boxing match with Linus tomorrow!!");
ysa.sharePost( content: "God I love tetris!!!! ");

ysa.blockUser(abdurrahman);
ysa.viewProfile(ethem);
ysa.sendMessage(ethem, content: "I believe in you kid..");
ysa.sendMessage(habılK, content: "How are you hocam?");
```

```
Logged in as ysa
Following mehmetG ...
Following yakupG ...
Shared a post.
Shared a post.
You have blocked abdurrahman.
Viewing ethem's Account...
-----
Username: ethem
Location : Gtu Library
Birth Date: 15.07.2002
This Account has 0 post(s).
ethem is following 0 account(s) and has 0 follower(s).
Sending a message to ethem...
Sending a message to habılK...
```

Notice that user ysa has blocked user abdurrahman, and because of that, abdurrahman wont be able to view ysa profile until he unblocks him.

Account ysa viewing his action history:

```
ysa.viewActionHistory();
```

```
Viewing Action History for ysa ...
```

```
-----
```

```
Logged in.
```

```
You followed mehmet6.
```

```
You followed yakup6.
```

```
You shared a post.
```

```
You shared a post.
```

```
You blocked abdurrahman.
```

```
You viewed ethem's profile.
```

```
You sent a message to ethem.
```

```
You sent a message to habilk.
```

```
-----
```

User abdurrahman doing activity:

```
abdurrahman.login();  
abdurrahman.viewProfile(ysa);  
abdurrahman.sharePost( content: "Why can't I see YSA's account???");  
abdurrahman.logout();
```

```
Logged in as abdurrahman
```

```
User not found.
```

```
Shared a post.
```

```
Logging out from account abdurrahman
```

See how user abdurrahman is blocked from interacting with user ysa.

User yakupG doing activity:

```
yakupG.login();
yakupG.followAccount(ethem);
yakupG.followAccount(ysa);
yakupG.leaveComment(ysa, postid: 1, content: "Don't you dare touch him hoca!!");
yakupG.likePost(ysa, postid: 2);
yakupG.leaveComment(ysa, postid: 2, content: "Damn right!!");
yakupG.sharePost( content: "Hey guys, i just uploaded your 824th assignment on teams!!");
```

```
Logged in as yakupG
Following ethem ...
Following ysa ...
Adding a comment on ysa's post...
Liking (Post ID: 2) of ysa...
Adding a comment on ysa's post...
```

```
yakupG.viewInteractions(ysa);
yakupG.sendMessage(ethem, content: "Let's do business you little genius!");
yakupG.blockUser(abdurrahman);
yakupG.viewActionHistory();
yakupG.logout();
```

```
Viewing ysa post interactions...
-----
(Post ID:1) I have a boxing match with Linus tomorrow!!
The post has 0 like(s)
The post has 1 comment(s)
Comment 1: 'yakupG' said: Don't you dare touch him hoca!!
-----
(Post ID:2) God I love tetris!!!!
The post has 1 like(s)
The post was liked by the following accounts: yakupG,
The post has 1 comment(s)
Comment 1: 'yakupG' said: Damn right!!
Sending a message to ethem...
You have blocked abdurrahman.
```

Action History for yakupG

```
Viewing Action History for yakupG ...
-----
Logged in.
You followed ethem.
You followed ysa.
You commented on ysa's post (Post ID: 1)
You liked ysa's post (Post ID: 2)
You commented on ysa's post (Post ID: 2)
You shared a post.
You viewed ysa's post interactions.
You sent a message to ethem.
You blocked abdurrahman.
-----
```

Account mehmetG doing activity:

```
mehmetG.login();
mehmetG.followAccount(ysa);
mehmetG.followAccount(yakupG);
mehmetG.blockUser(abdurrahman);
mehmetG.viewPosts(ysa);
mehmetG.likePost(ysa, postid: 1);
mehmetG.likePost(ysa, postid: 2);
mehmetG.leaveComment(ysa, postid: 1, content: "He is a nice guy hoca !!");
mehmetG.viewInteractions(ysa);
```

```
Logged in as mehmetG
Following ysa ...
Following yakupG ...
You have blocked abdurrahman.
Viewing ysa posts...
(Post ID:1) I have a boxing match with Linus tomorrow!!

(Post ID:2) God I love tetris!!!!

Liking (Post ID: 1) of ysa...
Liking (Post ID: 2) of ysa...
Adding a comment on ysa's post...
Viewing ysa post interactions...
-----
(Post ID:1) I have a boxing match with Linus tomorrow!!
The post has 1 like(s)
The post was liked by the following accounts: mehmetG,
The post has 2 comment(s)
Comment 1: 'yakupG' said: Don't you dare touch him hoca!!
Comment 2: 'mehmetG' said: He is a nice guy hoca !!
-----
(Post ID:2) God I love tetris!!!!
The post has 2 like(s)
The post was liked by the following accounts: yakupG,
mehmetG,
The post has 1 comment(s)
Comment 1: 'yakupG' said: Damn right!!
```

In the following section, mehmetG unlikes and uncomments from ysa post id 1, and views the interactions for ysa posts again. See how mehmetG's comment has disappeared.

```
mehmetG.uncomment(ysa, postid: 1, commentid: 2);
mehmetG.unlikePost(ysa, postid: 1);
mehmetG.viewInteractions(ysa);
```

```
You uncommented (removed a comment) from ysa's post. (Post ID: 1).
Unliking (Post ID: 1) of ysa...
Viewing ysa post interactions...
```

```
-----
(Post ID:1) I have a boxing match with Linus tomorrow!!
The post has 0 like(s)
The post has 1 comment(s)
Comment 1: 'yakupG' said: Don't you dare touch him hoca!!
-----
```

```
(Post ID:2) God I love tetris!!!!
The post has 2 like(s)
The post was liked by the following accounts: yakupG,
mehmetG,
The post has 1 comment(s)
Comment 1: 'yakupG' said: Damn right!!
```

Unblocking:

```
ysa.login();
ysa.unblockUser(abdurrahman);
ysa.logout();
```

```
You have unblocked abdurrahman.
```

```
abdurrahman.login();
abdurrahman.viewProfile(ysa);
abdurrahman.followAccount(ysa);
abdurrahman.sharePost( content: "YES!! He unblocked me !! Finally i can view YSA's account!! ");
abdurrahman.viewPosts(ysa);
abdurrahman.likePost(ysa, postid: 1);
abdurrahman.likePost(ysa, postid: 2);
abdurrahman.logout();
```



```
Logged in as abdurrahman
Viewing ysa's Account...
-----
Username: ysa
Location : Houston
Birth Date: 23.10.1971
This Account has 2 post(s).
ysa is following 2 account(s) and has 2 follower(s).
Following ysa ...
Shared a post.
Viewing ysa posts...
(Post ID:1) I have a boxing match with Linus tomorrow!!

(Post ID:2) God I love tetris!!!!

Liking (Post ID: 1) of ysa...
Liking (Post ID: 2) of ysa...
Logging out from account abdurrahman
```

As you can see above, after a user is unblocked, things turn back to normal.

Unfollow:

```
mehmetG.viewProfile(yakupG);
mehmetG.unfollowAccount(yakupG);
mehmetG.viewProfile(yakupG);
```

```
Viewing yakupG's Account...
-----
Username: yakupG
Location : Planet G-4723
Birth Date: 13.09.3047
This Account has 1 post(s).
yakupG is following 2 account(s) and has 2 follower(s).
Unfollowing yakupG...
Viewing yakupG's Account...
-----
Username: yakupG
Location : Planet G-4723
Birth Date: 13.09.3047
This Account has 1 post(s).
yakupG is following 2 account(s) and has 1 follower(s).
```

As you can see, the follower number of the account is decremented.

Messages:

```
ethem.login();
ethem.checkInbox();
ethem.viewInbox();
ethem.sendMessage(ysa, content: "It is an honor for me sir. I believe in myself too!");
ethem.sendMessage(yakupG, content: "That's an awesome offer hocam!! But let me finish my homeworks first :( ");
ethem.followAccount(ysa);
ethem.followAccount(yakupG);
ethem.followAccount(mehmetG);
ethem.followAccount(enesss);
ethem.sharePost( content: "I love gtU!");
ethem.unfollowAccount(enesss);
ethem.blockUser(enesss);
ethem.logout();
```

```
Logged in as ethem
Checking inbox...
There is/are 2 message(s) in the inbox.
Viewing inbox...
-----
Message ID: 1
From: ysa
To: ethem
Message: I believe in you kid..

Message ID: 2
From: yakupG
To: ethem
Message: Let's do business you little genius!

Sending a message to ysa...
Sending a message to yakupG...
Following ysa ...
Following yakupG ...
Following mehmetG ...
Following enesss ...
Shared a post.
Unfollowing enesss...
You have blocked enesss.
Logging out from account ethem
```

Experimental Running Time Analysis:

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Array	0.08900 s	0.09200 s	not available	not available
ArrayList	0.10500 s	0.11200 s	0.10100 s	0.11800 s
LinkedList	0.09500 s	0.09900 s	0.09900 s	0.11100 s
LDLinkedList	0.09700 s	0.10100 s	0.10100 s	0.10800 s

Time Complexities of LDLinkedList Class' Methods:

get(int index) - O(n): The method iterates through the linked list, skipping over any deleted nodes, until it reaches the node at the specified index. The worst-case time complexity is O(n) when the index is at the end of the list. The runtime is dependent on the index.

set(int index, E element) - O(n): The method iterates through the linked list, skipping over any deleted nodes, until it reaches the node at the specified index. Then it sets the node's item to the new element. The worst-case time complexity is O(n) when the index is at the end of the list. .

add(E item) - O(n): The method iterates through the linked list until it finds the last node, and then adds the new node to the end. The worst-case time complexity is O(n) since the node is added to the end of the list. The runtime is dependent on the size of the List.

remove(int index) - O(n): The method iterates through the linked list until it finds the node at the specified index, skipping over any deleted nodes. If the number of tombstones reaches a certain threshold, the method will remove them by iterating through the list again, potentially leading to a second O(n) time complexity. But $O(n) + O(n)$ is equal to $O(n)$ again. The worst-case time complexity is O(n) when the index is at the end of the list.

size() - O(1): The method simply returns the size variable, which is updated whenever a node is added or removed. The time complexity is O(1).

Problem Solution Approach for LDLinkedList:

I extended the AbstractList class and implemented List interface to create a new linked list class that implemented lazy deletion strategy called LDLinkedList.

Firstly, I have created a class called Node, which is the basic unit of a list, with the fields; content, next node and deleted flag for the lazy deletion strategy which is an exclusive specification to this assignment

To implement lazy deletion strategy in the list class, I introduced a new variable called "tombstones" which kept track of the number of deleted nodes. In the remove() method, instead of removing the node right away, I marked it as "deleted" by setting the "deleted" flag of the corresponding node to true, and this operation increases the number of tombstones by one. If the number of tombstones is less than 2, the node can remain in the list. However, if there are 2 or more tombstones, the method goes through the list and removes all nodes with the "deleted" flag set to true, which means removing the tombstones from the list. This way, the list avoids the overhead of removing a node and can achieve a faster runtime complexity. The add() method remains the same, and I added the necessary changes to the get() and set() methods to skip over the deleted nodes.