# GTU DEPARTMENT of COMPUTER ENGINEERING CSE222/505 – SPRING 2023 HOMEWORK 3 REPORT

ÖMER FARUK ÇOLAKEL 200104004043

# 1. SYSTEM REQUIREMENTS

public Account(int accountID, String userName, String birthDate, String location)

An account requires a unique id, a username, a birthdate and a location.

public Message(int messageID, String content, int senderID, int receiverID)

A message requires an ID which is given by the account sending and receiving it, a content, senderID and receiverID which was given by sender account. Sender and receiver hold the messages in separate arrays and same message have different IDs.

public Post(int postID, String content, int accountID)

A post requires a postID (which was given by the account posting it using number of posts in the account), content (which was given by the user) and accountID that is posting it.

public Interaction(int interactionID, int accountID, int postID)

Interaction class is an abstract class but it is a base class for Like and Comment classes. It is being called with super(interactionID, accountID, postID) by them. It requires an ID (which was given by the account automatically), accountID and postID is the of the post that the interaction was made on.

public Like(int interactionID, int accountID, int postID)

This constructor calls super class's constructor which is Interaction.

public Comment(int interactionID, int accountID, int postID, String content)

This constructor calls super class's constructor which is Interaction. Then sets the content by itself, since Interaction has no content.

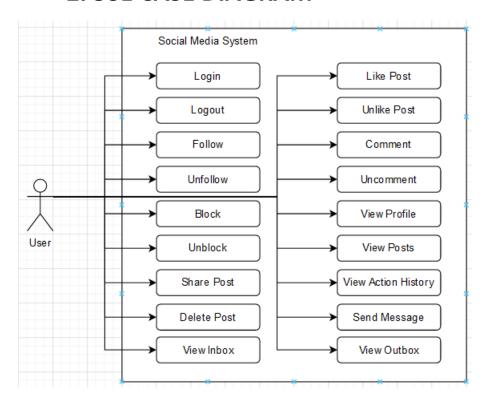
public LDLinkedList() {

LDLinkedList doesn't require any parameters to be instantiated.

public LDListIterator()

Iterator for LDLinkedList doesn't require any parameters to be instantiated.

## 2. USE CASE DIAGRAM



# 3. PROBLEM SOLUTION APPROACH

The difference between LinkedList and LDLinkedList is custom lazy deletion. I first, extended AbstractList class and implemented List interface for LDLinkedList. Because of this I had to override some methods.

I created a nested class for Node which holds "data" that has the type of "E" and references both for previous and next Node.

"deletedFlag" is a boolean and it's equal to true if user deleted an element. "deletedNode" holds the reference for that node. LDLinkedList and it's iterator works around these variables.

"toString" method to return all nodes' data. List hold the data of head(reference to first element), deletedNode(reference to previously deleted node) and size(size of the list).

"getNode" method takes an index, checks if the index is valid, finds the node with that index and returns the reference to it

First "add" method adds an element to the end of the list.

Second "add" method add an element with the given index. Problem with this method is that, we should check if there is a deleted node before or after that index. If there is, we should avoid referencing to it while adding the new node.

First "remove" method removes a node in given index. If there are no nodes that was deleted or program deleted two nodes, we should assign true to deletedFlag boolean and assign the reference of that node to deletedNode. If program deleted a node before, we should delete both nodes from the list.

Second "remove" method finds the index of the node with the given data and calls first "remove" method with that index.

Iterators are efficient ways of going through a list. So, I had to implement one. My iterator holds the data of previously returned node, next node and index of next node. Since I implemented the ListIterator interface I had to override some methods.

"hasNext" method checks if there is a next method. It checks if the next method is deleted or not. If it I is, then it checks if there is a node after the deleted node.

"next" method iterates to next node if there is a next node. Returns the data of the next node.

## 4-5. TEST CASES and RESULTS

You can run test cases according to the commands is readme.txt.

#### Login

```
sibelgulmez.login( userName: "sibelgulme");
sibelgulmez.login( userName: "sibelgulmez");
sibelgulmez.login( userName: "sibelgulmez");
```

#### **Login Result**

```
Login failed!

Logging into an account (username:sibelgulmez)...

You are already logged in!
```

#### **Sharing Post**

```
gokhankaya.sharePost(new Post( postID: 0, content: "Hello!", gokhankaya.getAccountID()));
sibelgulmez.sharePost(new Post( postID: 0, content: "Hello!", sibelgulmez.getAccountID()));
sibelgulmez.sharePost(new Post( postID: 0, content: "Hello!", sibelgulmez.getAccountID()));
sibelgulmez.sharePost(new Post( postID: 1, content: "Sibel Gülmez", sibelgulmez.getAccountID()));
```

#### **Sharing Post Result**

```
You need to login first!

Post shared successfully!

You have already shared this post!

Post shared successfully!
```

#### **Following**

```
sibelgulmez.follow(gizemsungu);
gokhankaya.follow(sibelgulmez);
sibelgulmez.follow(gizemsungu);
sibelgulmez.follow(gokhankaya);
```

#### **Following Result**

<sup>&</sup>quot;hasPrevious" method works like hasNext but checks previous nodes.

<sup>&</sup>quot;previous" method works like next method but iterates to previous node. Returns the data of previous node.

<sup>&</sup>quot;remove" method works like the previous remove method that I have mentioned.

```
You are now following gizemsungu
You need to login first!
You are already following this account!
You are now following gokhankaya
```

#### Logout

```
sibelgulmez.logout();
gokhankaya.logout();
```

#### **Logout Result**

```
Logging out from account 'sibelgulmez'...
You are already logged out!
```

#### **Viewing Profile and Posts**

```
gokhankaya.viewPosts(sibelgulmez);
gokhankaya.viewProfile(sibelgulmez);
gokhankaya.viewPosts(sibelgulmez);
```

#### **Viewing Profile and Posts Result**

```
You need to view the profile first!
Username: sibelgulmez
Location: USA
Birth Date: 01/01/2000
sibelgulmez is following 2 account(s) and has 0 follower(s).
sibelgulmez is following:
gizemsungu,
gokhankaya,
sibelgulmez has 2 posts.
Posts of sibelgulmez:
Post 1:
Hello!
Likes: 0
Comments: 0
Post 2:
Sibel Gülmez
Likes: 0
```

#### Liking a Post

```
gokhankaya.likePost(sibelgulmez, postID: 0);
gokhankaya.likePost(sibelgulmez, postID: 0);
```

#### **Liking a Post Result**

```
You liked the post!
You already liked this post!
```

#### Commenting

```
gokhankaya.comment(sibelgulmez, postID: 0, content: "Hello Sibel!");
```

#### **Commenting Result**

```
You commented on the post!
```

#### **Sending Message**

```
gokhankaya.sendMessage(gizemsungu, content: "Hi Gizem!");
```

#### **Sending Message Result**

Message sent!

#### **Viewing Outbox/Inbox**

```
gokhankaya.viewOutbox();
gokhankaya.viewInbox();
```

#### **Viewing Outbox/Inbox Result**

```
Message sent!
Message 1:
Message ID: 0
Content: Hi Gizem!
Receiver: 0
You have no messages in inbox!
```

#### **Blocking an Account**

```
gizemsungu.login( userName: "gizemsungu");
gizemsungu.blockAccount(sibelgulmez);
gizemsungu.logout();

sibelgulmez.login( userName: "sibelgulmez");
sibelgulmez.follow(gizemsungu);
sibelgulmez.viewProfile(gizemsungu);
sibelgulmez.sendMessage(gizemsungu, content: "Hello!");
sibelgulmez.logout();
```

#### **Blocking an Account Result**

```
Logging out from account 'gizemsungu'...

Logging into an account (username:gizemsungu)...

Account blocked!

Logging out from account 'gizemsungu'...

Logging into an account (username:sibelgulmez)...

You are blocked by this account!

You are blocked by this account!

You are blocked by this account!

Logging out from account 'sibelgulmez'...
```

#### **Viewing Comments**

```
gizemsungu.viewProfile(sibelgulmez);
gizemsungu.viewPosts(sibelgulmez);
gizemsungu.viewComments(sibelgulmez, postID: 0);
```

#### **Viewing Comments Result**

```
User ID: 2
Username: sibelgulmez
Location: USA
Birth Date: 01/01/2000
sibelgulmez is following 2 account(s) and has 1 follower(s).
sibelgulmez is following:
gizemsungu,
gokhankaya,
sibelgulmez has 2 posts.
Posts of sibelgulmez:
Post 1:
Post ID: 0
Hello!
Likes: 1
Comments: 1
Post 2:
Post ID: 1
Sibel Gülmez
Likes: 0
Comments: 0
Comments:
Hello Sibel!
```

#### **Unlike Post**

```
gokhankaya.unlikePost(gizemsungu, postID: 0);
```

#### **Unlike Post Result**

```
You have unliked a post!
```

#### **Delete Comment**

gokhankaya.uncomment(sibelgulmez, postID: 0);

#### **Delete Comment Result**

You have deleted a comment!

#### Unblock

gizemsungu.unblock(sibelgulmez);

#### **Unblock Result**

You have unblocked sibelgulmez!

#### **View Action History**

#### **View Action History Result**

#### Output of Scenario 1:

You have successfully logged in! Number of Comments: 0

You have shared a post! No one commented it yet.

You have shared a post! Post ID: 1

You are now following gizemsungu! Content: Sibel Gülmez

You are now following gokhankaya! Number of Likes: 0

You have successfully logged out! Number of Comments: 0

You have successfully logged in! No one commented it yet.

You should view this account first! Account ID: 0

Account ID: 2 Username: gizemsungu

Username: sibelgulmez Birth Date: 01/01/2000

Birth Date: 01/01/2000 Location: Turkey

Location: USA Number of Posts: 0

Number of Posts: 2 Number of Followers: 1

Number of Followers: 0 sibelgulmez

Number of Following: 2 Number of Following: 0

gizemsungu You have liked a post!

gokhankaya You have already liked this post!

Post ID: 0 You have commented a post!

Content: Hello! Account ID: 2

Number of Likes: 0 Username: sibelgulmez

Birth Date: 01/01/2000 Number of messages in outbox: 0

Location: USA Number of messages in inbox: 1

Number of Posts: 2 Message ID: 0

Number of Followers: 0 Sender: 1

Number of Following: 2 Content: Hi Gizem!

gizemsungu Account ID: 2

gokhankaya Username: sibelgulmez
Post ID: 0 Birth Date: 01/01/2000

Content: Hello! Location: USA

Number of Likes: 1 Number of Posts: 2

Number of Comments: 1 Number of Followers: 1

Comment count: 1 gokhankaya

Comments: Number of Following: 2

 1: Hello Sibel!
 gizemsungu

 Post ID: 1
 gokhankaya

Content: Sibel Gülmez Post ID: 0

Number of Likes: 0 Content: Hello!

Number of Comments: 0 Number of Likes: 1

No one commented it yet. Number of Comments: 1

You are now following sibelgulmez! Comment count: 1

You are now following gizemsungu! Comments:

You have sent a message to gizemsungu! 1: Hello Sibel!

You have sent 1 messages! Post ID: 1

Message ID: 0 Content: Sibel Gülmez

Receiver: 0 Number of Likes: 0

Content: Hi Gizem! Number of Comments: 0

You have successfully logged out! No one commented it yet.

You have successfully logged in! You have successfully logged out!

#### **Output of Scenario 2:**

You have successfully logged in! Account ID: 0

You have shared a post!

Username: gizemsungu

You have shared a post!

Birth Date: 01/01/2000

You have successfully logged out! Location: Turkey

You have successfully logged in! Number of Posts: 2

Number of Followers: 2 Number of Comments: 0

sibelgulmez No one commented it yet.

gokhankaya You have commented a post!

Number of Following: 0 You have sent a message to gizemsungu!

Post ID: 0 You have successfully logged out!

Content: Hello1! You have successfully logged in!

Number of Likes: 0 Account ID: 0

Number of Comments: 0 Username: gizemsungu

No one commented it yet. Birth Date: 01/01/2000

Post ID: 1 Location: Turkey

Content: Hello2! Number of Posts: 2

Number of Likes: 0 Number of Followers: 2

Number of Comments: 0 sibelgulmez

No one commented it yet. gokhankaya

You have liked a post! Number of Following: 0

You have successfully logged out! Post ID: 0

You have successfully logged in! Content: Hello1!

Account ID: 0 Number of Likes: 1

Username: gizemsungu Number of Comments: 0

Birth Date: 01/01/2000 No one commented it yet.

Location: Turkey Post ID: 1

Number of Posts: 2 Content: Hello2!

Number of Followers: 2 Number of Likes: 0

sibelgulmez Number of Comments: 1

gokhankaya Comment count: 1

Number of Following: 0 Comments:

Post ID: 0 1: Nice!

Content: Hello1! Message ID: 0

Number of Likes: 1 Sender: 1

Number of Comments: 0 Content: Hi Gizem!

No one commented it yet. Message ID: 1

Post ID: 1 Sender: 1

Content: Hello! Content: Hello!

Number of Likes: 0 You have successfully logged out!

#### **Output of Scenario 3:**

You have successfully logged in!

You have blocked sibelgulmez!

You have successfully logged out!

You have successfully logged in!

This account has blocked you!

This account has blocked you!

This account has blocked you!

You have successfully logged out!

#### **Output of Scenario 4:**

You have successfully logged in! Number of Comments: 0

You have shared a post! No one commented it yet.

You have shared a post! Account ID: 0

You are now following gizemsungu! Username: gizemsungu

You are now following gokhankaya! Birth Date: 01/01/2000

You have successfully logged out! Location: Turkey

You have successfully logged in! Number of Posts: 0

You should view this account first! Number of Followers: 1

Account ID: 2 sibelgulmez

Username: sibelgulmez

Number of Following: 0

Birth Date: 01/01/2000

You have liked a post!

Location: USA You have already liked this post!

Number of Posts: 2 You have commented a post!

Number of Followers: 0 Account ID: 2

Number of Following: 2 Username: sibelgulmez

gizemsungu Birth Date: 01/01/2000

gokhankaya Location: USA

Post ID: 0 Number of Posts: 2

Content: Hello! Number of Followers: 0

Number of Likes: 0 Number of Following: 2

Number of Comments: 0 gizemsungu

No one commented it yet. gokhankaya

Post ID: 1 Post ID: 0

Content: Sibel Gülmez

Content: Hello!

Number of Likes: 0

Number of Likes: 1

Number of Comments: 1 Number of Likes: 1

Comment count: 1 Number of Comments: 1

Comments: Comment count: 1

1: Hello Sibel! Comments:

Post ID: 1 1: Hello Sibel!

Content: Sibel Gülmez Post ID: 1

Number of Likes: 0 Content: Sibel Gülmez

Number of Comments: 0 Number of Likes: 0

No one commented it yet. Number of Comments: 0

You are now following sibelgulmez! No one commented it yet.

You are now following gizemsungu! You have successfully logged out!

You have sent a message to gizemsungu! You have successfully logged in!

You have sent 1 messages! You have shared a post!

Message ID: 0 You have shared a post!

Receiver: 0 You have successfully logged out!

Content: Hi Gizem! You have successfully logged in!

You have successfully logged out! Account ID: 0

You have successfully logged in! Username: gizemsungu

Number of messages in outbox: 0 Birth Date: 01/01/2000

Number of messages in inbox: 1 Location: Turkey

Message ID: 0 Number of Posts: 2

Sender: 1 Number of Followers: 2

Content: Hi Gizem! sibelgulmez

Account ID: 2 gokhankaya

Username: sibelgulmez Number of Following: 0

Birth Date: 01/01/2000 Post ID: 0

Location: USA Content: Hello1!

Number of Posts: 2 Number of Likes: 0

Number of Followers: 1 Number of Comments: 0

gokhankaya No one commented it yet.

Number of Following: 2 Post ID: 1

gizemsungu Content: Hello2!

gokhankaya Number of Likes: 0

Post ID: 0 Number of Comments: 0

Content: Hello! No one commented it yet.

You have liked a post! Post ID: 0

You have successfully logged out! Content: Hello1!

You have successfully logged in! Number of Likes: 1

Account ID: 0 Number of Comments: 0

Username: gizemsungu No one commented it yet.

Birth Date: 01/01/2000 Post ID: 1

Location: Turkey Content: Hello2!

Number of Posts: 2 Number of Likes: 0

Number of Followers: 2 Number of Comments: 1

sibelgulmez Comment count: 1

gokhankaya Comments:

Number of Following: 0 1: Nice!

Post ID: 0 Message ID: 0

Content: Hello1! Sender: 1

Number of Likes: 1 Content: Hi Gizem!

Number of Comments: 0 Message ID: 1

No one commented it yet. Sender: 1

Post ID: 1 Content: Hello!

Content: Hello2! You have successfully logged out!

Number of Likes: 0 You have successfully logged in!

Number of Comments: 0 You have blocked sibelgulmez!

No one commented it yet. You have successfully logged out!

You have commented a post! You have successfully logged in!

You have sent a message to gizemsungu! This account has blocked you!

You have successfully logged out! This account has blocked you!

You have successfully logged in! This account has blocked you!

Account ID: 0 You have successfully logged out!

Username: gizemsungu SCENARIO 4

Birth Date: 01/01/2000 You have successfully logged in!

Location: Turkey You are now following account4!

Number of Posts: 2 You are now following account5!

Number of Followers: 2 You are now following account6!

sibelgulmez You are now following account?!

gokhankaya You are now following account8!

Number of Following: 0 You are now following account9!

You are now following account 10!

You have successfully logged out! After Like:

UNLIKE: Account ID: 0

Username: gizemsungu

You have successfully logged in! Birth Date: 01/01/2000

Location: Turkey

Before Like: Number of Posts: 2

Account ID: 0 Number of Followers: 1

Username: gizemsungu gokhankaya

Birth Date: 01/01/2000 Number of Following: 7

Location: Turkey account4

Number of Posts: 2 account5

Number of Followers: 1 account6

gokhankaya account7

Number of Following: 7 account8

account4 account9

account5 account10

account6 Post ID: 0

account7 Content: Hello1!

account8 Number of Likes: 2

account9 Number of Comments: 0

account10 No one commented it yet.

Post ID: 0 Post ID: 1

Content: Hello1! Content: Hello2!

Number of Likes: 1 Number of Likes: 0

Number of Comments: 0 Number of Comments: 1

No one commented it yet. Comment count: 1

Post ID: 1 Comments:

Content: Hello2! 1: Nice!

Number of Likes: 0 You have unliked a post!

Number of Comments: 1

Comment count: 1 After Unlike:

Comments: Account ID: 0

1: Nice! Username: gizemsungu

You have liked a post! Birth Date: 01/01/2000

Location: Turkey Location: Turkey

Number of Posts: 2 Number of Posts: 2

Number of Followers: 1 Number of Followers: 1

gokhankaya gokhankaya

Number of Following: 7 Number of Following: 7

account4 account4

account5 account5

account6 account6

account7 account7

account8 account8

account9 account9

account10 account10

Post ID: 0 Post ID: 0

Content: Hello1! Content: Hello1!

Number of Likes: 1 Number of Likes: 1

Number of Comments: 0 Number of Comments: 0

No one commented it yet. No one commented it yet.

Post ID: 1 Post ID: 1

Content: Hello2! Content: Hello2!

Number of Likes: 0 Number of Likes: 0

Number of Comments: 1 Number of Comments: 1

Comment count: 1 Comment count: 1

Comments: Comments:

1: Nice! 1: Nice!

You have successfully logged out! You are now following gizemsungu!

You have sent a message to gizemsungu!

UNBLOCK: You have successfully logged out!

You have successfully logged in!

You have successfully logged in! Message ID: 0

You have unblocked sibelgulmez! Sender: 1

You have successfully logged out! Content: Hi Gizem!

You have successfully logged in! Message ID: 1

Account ID: 0 Sender: 1

Username: gizemsungu Content: Hello!

Birth Date: 01/01/2000 Message ID: 0

Sender: 2 Number of Followers: 1

Content: Hello! gokhankaya

You have successfully logged out! Number of Following: 2

gokhankaya

UNCOMMENT: gizemsungu

Post ID: 0

You have successfully logged in! Content: Hello!

Account ID: 2 Number of Likes: 1

Username: sibelgulmez Number of Comments: 0

Birth Date: 01/01/2000 No one commented it yet.

Location: USA Post ID: 1

Number of Posts: 2 Content: Sibel Gülmez

Number of Followers: 1 Number of Likes: 0

gokhankaya Number of Comments: 0

Number of Following: 2 No one commented it yet.

gokhankaya

gizemsungu UNFOLLOW:

Post ID: 0

Content: Hello! Account ID: 2

Number of Likes: 1 Username: sibelgulmez

Number of Comments: 1 Birth Date: 01/01/2000

Comment count: 1 Location: USA

Comments: Number of Posts: 2

1: Hello Sibel! Number of Followers: 1

Post ID: 1 gokhankaya

Content: Sibel Gülmez Number of Following: 2

Number of Likes: 0gokhankayaNumber of Comments: 0gizemsunguNo one commented it yet.Account ID: 1

You have deleted a comment! Username: gokhankaya

Account ID: 2 Birth Date: 01/01/2000

Username: sibelgulmez Location: UK

Birth Date: 01/01/2000 Number of Posts: 0

Location: USA Number of Followers: 1

Number of Posts: 2 sibelgulmez

Number of Following: 2 Number of Following: 2

sibelgulmez gokhankaya

gizemsungu gizemsungu

You are no longer following sibelgulmez! You have successfully logged out!

Account ID: 1

Username: gokhankaya Action History:

Birth Date: 01/01/2000

Location: UK You have successfully logged in!

Number of Posts: 0 sibelgulmez is now following you!

Number of Followers: 1 You have liked a post!

sibelgulmez You have commented a post!

Number of Following: 1 You are now following sibelgulmez!

gizemsungu You are now following gizemsungu!

You have successfully logged out! You have sent a message to gizemsungu!

You have successfully logged in! You have commented a post!

Account ID: 2 You have sent a message to gizemsungu!

Username: sibelgulmez You have liked a post!

Birth Date: 01/01/2000 You have unliked a post!

Location: USA You have deleted a comment!

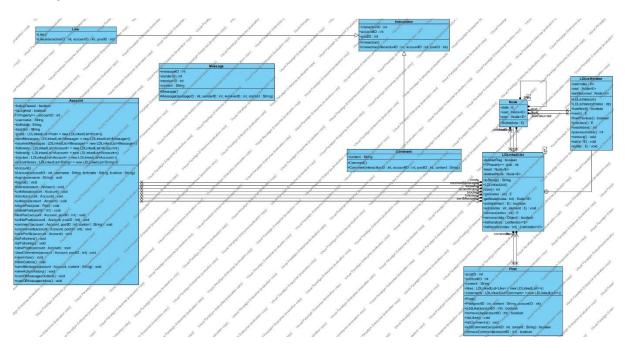
Number of Posts: 2 You are no longer following sibelgulmez!

Number of Followers: 0 You have successfully logged out!

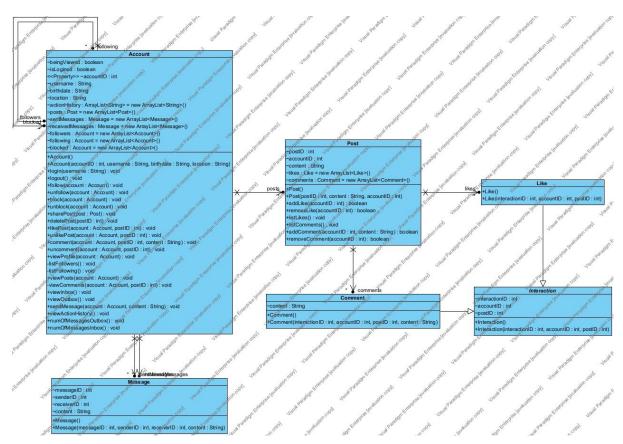
# 6. CLASS DIAGRAMS

Originals can be found as PNG.

Class Diagram for Part 1 and Part 2



#### Class Diagram for Part 3



# **Time Complexity**

## **Sharing Post**

Array	ArrayList	LinkedList	LDLinkedList
3ms	0ms	1ms	2ms
ollow	•		
Array	ArrayList	LinkedList	LDLinkedList
0ms	6ms	5ms	6ms
Jnfollow	•		
Array	ArrayList	LinkedList	LDLinkedList
_	0ms	0ms	0ms

#### Block

Array	ArrayList	LinkedList	LDLinkedList
0ms	1ms	0ms	0ms

#### Unblock

Array	ArrayList	LinkedList	LDLinkedList
-	1ms	0ms	0ms

#### **Like Post**

Array	ArrayList	LinkedList	LDLinkedList
0ms	1ms	1ms	2ms

#### **Unlike Post**

Array	ArrayList	LinkedList	LDLinkedList
-	0ms	0ms	0ms

#### Comment

Array	ArrayList	LinkedList	LDLinkedList
0ms	0ms	0ms	0ms

#### Uncomment

Array	ArrayList	LinkedList	LDLinkedList
•	0ms	0ms	0ms

#### **Send Message**

Array	ArrayList	LinkedList	LDLinkedList
0ms	1ms	1ms	1ms

All of this methods' worst-case scenario is O(n) regardless of data structures that we use. We don't have to do anything special for array but for others we should use iterators. Without iterators, big oh notations would be O(n^2) since we are going through the list from the start to get an element. Iterators marks last returned element so we don't have to go through the list constantly. I used them in arraylist, linkedlist and Idlinkedlist.