```
::::::::::::::
Lab2Status.txt
::::::::::::::
Problem 1: compiles, runs correctly on all provided input
Problem 2: compiles, runs correctly on all provided input
Problem 3: Completed and attached in ListInterfaceRelatedArrayListCode
Problem 4: Complete
Extra Credit: Complete::::::::::::::
Lab2Conclusions.txt
::::::::::::::
I learned about more efficient ways to deal with collections.
I also felt like I learned what the behing-the-scenes of collections looks like.
I did not exactly expect to hold the variable numItems, but it
was still valuable to really see it all in action.
I also learned that whoever wrote ArrayList has a very,
very different coding style from me.

Doing the Extra Credit made me realize that System.arraycopy is fast,
although the parameters were a little confusing at first.::::::::::::::
Lab2P1Driver.java
::::::::::::::
import java.io.*;

/*
 * Purpose: Data Structure and Algorithms Lab 2 Problem 1
 * Status: Complete and thoroughly tested
 * Last update: 09/19/22
 * Submitted:  09/19/22
 * Comment: test suite and sample run attached
 * Comment: I declare that this is entirely my own work
 * @author: William Carr
 * @version: 2023.09.19
 */

public class Lab2P1Driver {

    public static void main(String[] args) throws NumberFormatException, IOExcepti
on {

        BufferedReader stdin = new BufferedReader(new InputStreamReader(System.in)
);
        ListArrayBasedPlus myList = new ListArrayBasedPlus();

        System.out.println("Select from the following menu:\n"
                           +"\t0. Exit program\n"
                           +"\t1. Insert item into the list\n"
                           +"\t2. Remove item from the list\n"
                           +"\t3. Get item from the list\n"
                           +"\t4. Clear the list\n"
                           +"\t5. Print size and content of the list\n"
                           +"\t6. Reverse the list\n");

        int selection, position;
        boolean continuing = true;
        String itemName;
        Object returned;
        do {

            System.out.print("Make your menu selection now: ");
            selection = Integer.parseInt(stdin.readLine().trim());
            System.out.println(selection);
```

```
            switch(selection) {
            case 1:
                System.out.print("You are now inserting an item"+
                                 " into the list.\n\tEnter item: ");
                itemName = stdin.readLine().trim();
                System.out.println(itemName);

                System.out.print("\tEnter position to insert item in: ");
                position = Integer.parseInt(stdin.readLine().trim());
                System.out.println(position);
                if(position < 0 || position > myList.size())
                    System.out.println("Position specified is out of range!\n");
                else {
                    myList.add(position, itemName);
                    System.out.printf("Item %s inserted into"+
                                      " position %d in the list.%n%n", itemName, p
osition);
                }
                break;
            case 2:
                System.out.print("\tEnter position to remove item from: ");
                position = Integer.parseInt(stdin.readLine().trim());
                System.out.println(position);
                if(position < 0 || position >= myList.size())
                    System.out.println("Position specified is out of range!\n");
                else {
                    returned = myList.remove(position);
                    System.out.printf("Item %s removed from"+
                                      " position %d in the list.%n%n", returned.to
String(), position);
                }
                break;
            case 3:
                System.out.print("\tEnter position to retrieve item from: ");
                position = Integer.parseInt(stdin.readLine().trim());
                System.out.println(position);
                if(position < 0 || position >= myList.size())
                    System.out.println("Position specified is out of range!\n");
                else {
                    returned = myList.get(position);
                    System.out.printf("Item %s retrieved from"+
                                      " position %d in the list.%n%n", returned.to
String(), position);
                }
                break;
            case 4:
                myList.removeAll();
                System.out.println();
                break;
            case 5:
                printList(myList);
                break;
            case 6:
                myList.reverse();
                System.out.println("List reversed\n");
                break;
            default: // continuing unless told to stop
                continuing = false;
                System.out.println("Exiting program... Goodbye!");
                break;
            }
```

```
        } while(continuing);

    }

    /**
     * Prints list after checking for null/empty
     * @param list
     */
    private static void printList(ListArrayBasedPlus list) {
        if(list == null || list.size() == 0)
            System.out.println("\tList is empty.\n");
        else
            System.out.printf("\tList of size %d has the following items: %s%n%n",
                              list.size(), list.toString());
    }

}::::::::::::::
Lab2P1Sampleruns.txt
::::::::::::::
Select from the following menu:
        0. Exit program
        1. Insert item into the list
        2. Remove item from the list
        3. Get item from the list
        4. Clear the list
        5. Print size and content of the list
        6. Reverse the list

Make your menu selection now: 5
        List is empty.

Make your menu selection now: 1
You are now inserting an item into the list.
        Enter item: Data
        Enter position to insert item in: 0
Item Data inserted into position 0 in the list.

Make your menu selection now: 5
        List of size 1 has the following items: Data

Make your menu selection now: 1
You are now inserting an item into the list.
        Enter item: Beverly
        Enter position to insert item in: 0
Item Beverly inserted into position 0 in the list.

Make your menu selection now: 5
        List of size 2 has the following items: Beverly Data

Make your menu selection now: 1
You are now inserting an item into the list.
        Enter item: Jean-Luc
        Enter position to insert item in: 4
Position specified is out of range!

Make your menu selection now: 5
        List of size 2 has the following items: Beverly Data

Make your menu selection now: 1
You are now inserting an item into the list.
        Enter item: Jean-Luc
        Enter position to insert item in: 2
Item Jean-Luc inserted into position 2 in the list.

Make your menu selection now: 1
You are now inserting an item into the list.
        Enter item: Geordi
        Enter position to insert item in: 1
Item Geordi inserted into position 1 in the list.

Make your menu selection now: 1
You are now inserting an item into the list.
        Enter item: Worf
        Enter position to insert item in: 3
Item Worf inserted into position 3 in the list.

Make your menu selection now: 5
        List of size 5 has the following items: Beverly Geordi Data Worf Jean-Luc

Make your menu selection now: 6
List reversed

Make your menu selection now: 5
        List of size 5 has the following items: Jean-Luc Worf Data Geordi Beverly

Make your menu selection now: 2
        Enter position to remove item from: 5
Position specified is out of range!

Make your menu selection now: 2
        Enter position to remove item from: 3
Item Geordi removed from position 3 in the list.

Make your menu selection now: 5
        List of size 4 has the following items: Jean-Luc Worf Data Beverly

Make your menu selection now: 2
        Enter position to remove item from: 0
Item Jean-Luc removed from position 0 in the list.

Make your menu selection now: 1
You are now inserting an item into the list.
        Enter item: Will
        Enter position to insert item in: 1
Item Will inserted into position 1 in the list.

Make your menu selection now: 5
        List of size 4 has the following items: Worf Will Data Beverly

Make your menu selection now: 3
        Enter position to retrieve item from: 2
Item Data retrieved from position 2 in the list.

Make your menu selection now: 3
        Enter position to retrieve item from: 0
Item Worf retrieved from position 0 in the list.

Make your menu selection now: 3
        Enter position to retrieve item from: 7
Position specified is out of range!

Make your menu selection now: 5
        List of size 4 has the following items: Worf Will Data Beverly
```

```
Make your menu selection now: 6
List reversed

Make your menu selection now: 5
        List of size 4 has the following items: Beverly Data Will Worf

Make your menu selection now: 4

Make your menu selection now: 5
        List is empty.

Make your menu selection now: 0
Exiting program... Goodbye!
::::::::::::::
Lab2P2Driver.java
::::::::::::::
import java.io.*;

/*
 * Purpose: Data Structure and Algorithms Lab 2 Problem 2
 * Status: Complete and thoroughly tested
 * Last update: 09/19/22
 * Submitted:  09/19/22
 * Comment: test suite and sample run attached
 * Comment: I declare that this is entirely my own work
 * @author: William Carr
 * @version: 2023.09.19
 */

public class Lab2P2Driver {

    public static void main(String[] args) throws NumberFormatException, IOExcepti
on {

        BufferedReader stdin = new BufferedReader(new InputStreamReader(System.in)
);
        ListArrayListBasedPlus myList = new ListArrayListBasedPlus();

        System.out.println("Select from the following menu:\n"
                           +"\t0. Exit program\n"
                           +"\t1. Insert item into the list\n"
                           +"\t2. Remove item from the list\n"
                           +"\t3. Get item from the list\n"
                           +"\t4. Clear the list\n"
                           +"\t5. Print size and content of the list\n"
                           +"\t6. Reverse the list\n");

        int selection, position;
        boolean continuing = true;
        String itemName;
        Object returned;
        do {

            System.out.print("Make your menu selection now: ");
            selection = Integer.parseInt(stdin.readLine().trim());
            System.out.println(selection);

            switch(selection) {
            case 1:
                System.out.print("You are now inserting an item"+
                                 " into the list.\n\tEnter item: ");
                itemName = stdin.readLine().trim();
```

```
                System.out.println(itemName);

                System.out.print("\tEnter position to insert item in: ");
                position = Integer.parseInt(stdin.readLine().trim());
                System.out.println(position);
                if(position < 0 || position > myList.size())
                    System.out.println("Position specified is out of range!\n");
                else {
                    myList.add(position, itemName);
                    System.out.printf("Item %s inserted into"+
                                      " position %d in the list.%n%n", itemName, p
osition);
                }
                break;
            case 2:
                System.out.print("\tEnter position to remove item from: ");
                position = Integer.parseInt(stdin.readLine().trim());
                System.out.println(position);
                if(position < 0 || position >= myList.size())
                    System.out.println("Position specified is out of range!\n");
                else {
                    returned = myList.remove(position);
                    System.out.printf("Item %s removed from"+
                                      " position %d in the list.%n%n", returned.to
String(), position);
                }
                break;
            case 3:
                System.out.print("\tEnter position to retrieve item from: ");
                position = Integer.parseInt(stdin.readLine().trim());
                System.out.println(position);
                if(position < 0 || position >= myList.size())
                    System.out.println("Position specified is out of range!\n");
                else {
                    returned = myList.get(position);
                    System.out.printf("Item %s retrieved from"+
                                      " position %d in the list.%n%n", returned.to
String(), position);
                }
                break;
            case 4:
                myList.removeAll();
                System.out.println();
                break;
            case 5:
                printList(myList);
                break;
            case 6:
                myList.reverse();
                System.out.println("List reversed\n");
                break;
            default: // continuing unless told to stop
                continuing = false;
                System.out.println("Exiting program... Goodbye!");
                break;
            }

        } while(continuing);

    }

    /**
```

```
     * Prints list after checking for null/empty
     * @param list
     */
    private static void printList(ListArrayListBasedPlus list) {
        if(list == null || list.size() == 0)
            System.out.println("\tList is empty.\n");
        else
            System.out.printf("\tList of size %d has the following items: %s%n%n",
                              list.size(), list.toString());
    }

}::::::::::::::
Lab2P2Sampleruns.txt
::::::::::::::
Select from the following menu:
        0. Exit program
        1. Insert item into the list
        2. Remove item from the list
        3. Get item from the list
        4. Clear the list
        5. Print size and content of the list
        6. Reverse the list

Make your menu selection now: 5
        List is empty.

Make your menu selection now: 1
You are now inserting an item into the list.
        Enter item: Data
        Enter position to insert item in: 0
Item Data inserted into position 0 in the list.

Make your menu selection now: 5
        List of size 1 has the following items: [Data]

Make your menu selection now: 1
You are now inserting an item into the list.
        Enter item: Beverly
        Enter position to insert item in: 0
Item Beverly inserted into position 0 in the list.

Make your menu selection now: 5
        List of size 2 has the following items: [Beverly, Data]

Make your menu selection now: 1
You are now inserting an item into the list.
        Enter item: Jean-Luc
        Enter position to insert item in: 4
Position specified is out of range!

Make your menu selection now: 5
        List of size 2 has the following items: [Beverly, Data]

Make your menu selection now: 1
You are now inserting an item into the list.
        Enter item: Jean-Luc
        Enter position to insert item in: 2
Item Jean-Luc inserted into position 2 in the list.

Make your menu selection now: 1
You are now inserting an item into the list.
        Enter item: Geordi
        Enter position to insert item in: 1
Item Geordi inserted into position 1 in the list.

Make your menu selection now: 1
You are now inserting an item into the list.
        Enter item: Worf
        Enter position to insert item in: 3
Item Worf inserted into position 3 in the list.

Make your menu selection now: 5
        List of size 5 has the following items: [Beverly, Geordi, Data, Worf, Jean
-Luc]

Make your menu selection now: 6
List reversed

Make your menu selection now: 5
        List of size 5 has the following items: [Jean-Luc, Worf, Data, Geordi, Bev
erly]

Make your menu selection now: 2
        Enter position to remove item from: 5
Position specified is out of range!

Make your menu selection now: 2
        Enter position to remove item from: 3
Item Geordi removed from position 3 in the list.

Make your menu selection now: 5
        List of size 4 has the following items: [Jean-Luc, Worf, Data, Beverly]

Make your menu selection now: 2
        Enter position to remove item from: 0
Item Jean-Luc removed from position 0 in the list.

Make your menu selection now: 1
You are now inserting an item into the list.
        Enter item: Will
        Enter position to insert item in: 1
Item Will inserted into position 1 in the list.

Make your menu selection now: 5
        List of size 4 has the following items: [Worf, Will, Data, Beverly]

Make your menu selection now: 3
        Enter position to retrieve item from: 2
Item Data retrieved from position 2 in the list.

Make your menu selection now: 3
        Enter position to retrieve item from: 0
Item Worf retrieved from position 0 in the list.

Make your menu selection now: 3
        Enter position to retrieve item from: 7
Position specified is out of range!

Make your menu selection now: 5
        List of size 4 has the following items: [Worf, Will, Data, Beverly]

Make your menu selection now: 6
List reversed
```

```
Make your menu selection now: 5
        List of size 4 has the following items: [Beverly, Data, Will, Worf]

Make your menu selection now: 4

Make your menu selection now: 5
        List is empty.

Make your menu selection now: 0
Exiting program... Goodbye!
::::::::::::::
Lab2ECDriver.java
::::::::::::::
import java.io.*;

/*
 * Purpose: Data Structure and Algorithms Lab 2 EC Extra Credit
 * Status: Complete and thoroughly tested
 * Last update: 09/19/22
 * Submitted:  09/19/22
 * Comment: test suite and sample run attached
 * Comment: I declare that this is entirely my own work
 * @author: William Carr
 * @version: 2023.09.19
 */

public class Lab2ECDriver {

    public static void main(String[] args) throws NumberFormatException, IOExcepti
on {

        BufferedReader stdin = new BufferedReader(new InputStreamReader(System.in)
);
        ListArrayBasedPlus myList = new ListArrayBasedPlus();

        System.out.println("Select from the following menu:\n"
                           +"\t0. Exit program\n"
                           +"\t1. Insert item into the list\n"
                           +"\t2. Remove item from the list\n"
                           +"\t3. Get item from the list\n"
                           +"\t4. Clear the list\n"
                           +"\t5. Print size and content of the list\n"
                           +"\t6. Reverse the list\n");

        int selection, position;
        boolean continuing = true;
        String itemName;
        Object returned;
        do {

            System.out.print("Make your menu selection now: ");
            selection = Integer.parseInt(stdin.readLine().trim());
            System.out.println(selection);

            switch(selection) {
            case 1:
                System.out.print("You are now inserting an item"+
                                 " into the list.\n\tEnter item: ");
                itemName = stdin.readLine().trim();
                System.out.println(itemName);

                System.out.print("\tEnter position to insert item in: ");
                position = Integer.parseInt(stdin.readLine().trim());
                System.out.println(position);
                if(position < 0 || position > myList.size())
                    System.out.println("Position specified is out of range!\n");
                else {
                    myList.add(position, itemName);
                    System.out.printf("Item %s inserted into"+
                                      " position %d in the list.%n%n", itemName, p
osition);
                }
                break;
            case 2:
                System.out.print("\tEnter position to remove item from: ");
                position = Integer.parseInt(stdin.readLine().trim());
                System.out.println(position);
                if(position < 0 || position >= myList.size())
                    System.out.println("Position specified is out of range!\n");
                else {
                    returned = myList.remove(position);
                    System.out.printf("Item %s removed from"+
                                      " position %d in the list.%n%n", returned.to
String(), position);
                }
                break;
            case 3:
                System.out.print("\tEnter position to retrieve item from: ");
                position = Integer.parseInt(stdin.readLine().trim());
                System.out.println(position);
                if(position < 0 || position >= myList.size())
                    System.out.println("Position specified is out of range!\n");
                else {
                    returned = myList.get(position);
                    System.out.printf("Item %s retrieved from"+
                                      " position %d in the list.%n%n", returned.to
String(), position);
                }
                break;
            case 4:
                myList.removeAll();
                System.out.println();
                break;
            case 5:
                printList(myList);
                break;
            case 6:
                myList.reverse();
                System.out.println("List reversed\n");
                break;
            default: // continuing unless told to stop
                continuing = false;
                System.out.println("Exiting program... Goodbye!");
                break;
            }

        } while(continuing);

    }

    /**
     * Prints list after checking for null/empty
     * @param list
     */
    private static void printList(ListArrayBasedPlus list) {
        if(list == null || list.size() == 0)
            System.out.println("\tList is empty.\n");
        else
            System.out.printf("\tList of size %d has the following items: %s%n%n",
                              list.size(), list.toString());
    }

}::::::::::::::
Lab2ECSampleruns.txt
::::::::::::::
Select from the following menu:
        0. Exit program
        1. Insert item into the list
        2. Remove item from the list
        3. Get item from the list
        4. Clear the list
        5. Print size and content of the list
        6. Reverse the list

Make your menu selection now: 5
        List is empty.

Make your menu selection now: 1
You are now inserting an item into the list.
        Enter item: Data
        Enter position to insert item in: 0
Item Data inserted into position 0 in the list.

Make your menu selection now: 5
        List of size 1 has the following items: Data

Make your menu selection now: 1
You are now inserting an item into the list.
        Enter item: Beverly
        Enter position to insert item in: 0
Item Beverly inserted into position 0 in the list.

Make your menu selection now: 5
        List of size 2 has the following items: Beverly Data

Make your menu selection now: 1
You are now inserting an item into the list.
        Enter item: Jean-Luc
        Enter position to insert item in: 4
Position specified is out of range!

Make your menu selection now: 5
        List of size 2 has the following items: Beverly Data

Make your menu selection now: 1
You are now inserting an item into the list.
        Enter item: Jean-Luc
        Enter position to insert item in: 2
Item Jean-Luc inserted into position 2 in the list.

Make your menu selection now: 1
You are now inserting an item into the list.
        Enter item: Geordi
        Enter position to insert item in: 1
Item Geordi inserted into position 1 in the list.
```

```
Make your menu selection now: 1
You are now inserting an item into the list.
        Enter item: Worf
        Enter position to insert item in: 3
Item Worf inserted into position 3 in the list.

Make your menu selection now: 5
        List of size 5 has the following items: Beverly Geordi Data Worf Jean-Luc

Make your menu selection now: 6
List reversed

Make your menu selection now: 5
        List of size 5 has the following items: Jean-Luc Worf Data Geordi Beverly

Make your menu selection now: 2
        Enter position to remove item from: 5
Position specified is out of range!

Make your menu selection now: 2
        Enter position to remove item from: 3
Item Geordi removed from position 3 in the list.

Make your menu selection now: 5
        List of size 4 has the following items: Jean-Luc Worf Data Beverly

Make your menu selection now: 2
        Enter position to remove item from: 0
Item Jean-Luc removed from position 0 in the list.

Make your menu selection now: 1
You are now inserting an item into the list.
        Enter item: Will
        Enter position to insert item in: 1
Item Will inserted into position 1 in the list.

Make your menu selection now: 5
        List of size 4 has the following items: Worf Will Data Beverly

Make your menu selection now: 3
        Enter position to retrieve item from: 2
Item Data retrieved from position 2 in the list.

Make your menu selection now: 3
        Enter position to retrieve item from: 0
Item Worf retrieved from position 0 in the list.

Make your menu selection now: 3
        Enter position to retrieve item from: 7
Position specified is out of range!

Make your menu selection now: 5
        List of size 4 has the following items: Worf Will Data Beverly

Make your menu selection now: 6
List reversed

Make your menu selection now: 5
        List of size 4 has the following items: Beverly Data Will Worf

Make your menu selection now: 4
Make your menu selection now: 5
        List is empty.

Make your menu selection now: 0
Exiting program... Goodbye!
```