


```

        numItems = 0;
    } // end default constructor

    public boolean isEmpty()
    {
        return (numItems == 0);
    } // end isEmpty

    public int size()
    {
        return numItems;
    } // end size

    public void removeAll()
    {
        // Creates a new array; marks old array for
        // garbage collection.
        items = new Object[MAX_LIST];
        numItems = 0;
    } // end removeAll

    public void add(int index, Object item) // fixes implementation/programming st
yle errors
    throws ListIndexOutOfBoundsException
    {
        if (numItems == items.length)
        {
            throw new ListException("ListException on add");
        } // end if
        if (index >= 0 && index <= numItems)
        {
            // make room for new element by shifting all items at
            // positions >= index toward the end of the
            // list (no shift if index == numItems+1)
            for (int pos = numItems-1; pos >= index; pos--) //textbook code modif
ied to eliminate logic error causing ArrayIndexOutOfBoundsException
            {
                items[pos+1] = items[pos];
            } // end for
            // insert new item
            items[index] = item;
            numItems++;
        }
        else
        {
            // index out of range
            throw new ListIndexOutOfBoundsException(
                "ListIndexOutOfBoundsException on add");
        } // end if
    } //end add

    public Object get(int index)
    throws ListIndexOutOfBoundsException
    {
        if (index >= 0 && index < numItems)
        {
            return items[index];
        }
        else
        {
            // index out of range
            throw new ListIndexOutOfBoundsException(

```

```

                "ListIndexOutOfBoundsException on get");
        } // end if
    } // end get

    public Object remove(int index)
    throws ListIndexOutOfBoundsException
    {
        Object result;
        if (index >= 0 && index < numItems)
        {
            // delete item by shifting all items at
            // positions > index toward the beginning of the list
            // (no shift if index == size)
            result = items[index];
            if (numItems == items.length)
            {
                throw new ListException("ListException on remove");
            }
            for (int pos = index+1; pos < numItems; pos++) //textbook code modifie
d to eliminate logic error causing ArrayIndexOutOfBoundsException
            {
                items[pos-1] = items[pos];
            } // end for
            items[--numItems] = null; // fixes memory leak
        }
        else
        {
            // index out of range
            throw new ListIndexOutOfBoundsException(
                "ListIndexOutOfBoundsException on remove");
        } // end if
        return result;
    } //end remove
}

:::::::::::::
ListArrayBasedPlus.java
:::::::::::::
/*
 * Purpose: Data Structure and Algorithms Review Programming Assignment
 * Status: Complete and thoroughly tested
 * Last update: 02/02/23
 * Submitted: 02/02/23
 * Comment: test suite and sample run attached
 * Comment: I declare that this is entirely my own work
 * @author: Antonio Rosado
 * @version: 2023.02.02
 */

```

```

public class ListArrayBasedPlus extends ListArrayBased
{
    /**
     * Constructor.
     */
    public ListArrayBasedPlus() {
        super();
    }

    /**
     * Adds items to Array
     */
    public void add(int index, Object item)
    {
        if (items.length == numItems)

```

```

{
    static BufferedReader stdin = new BufferedReader(new InputStreamReader(System.
in));
    public static void main (String[] args) throws IOException
    {
        ListArrayBasedPlus list_plus = new ListArrayBasedPlus();
        boolean exit = false;
        int pos = -1;

        while (!exit) {
            System.out.println("Select from the following menu: \n"
                + "0. Exit the program \n"
                + "1. Insert item into the list \n"
                + "2. Remove item from the list \n"
                + "3. Get item from the list \n"
                + "4. Clear the list \n"
                + "5. Print size and content of the list \n"
                + "6. Reverse the list \n ");

            System.out.print("Make your menu selection now: " );
            int input = Integer.parseInt(stdin.readLine());
            System.out.println(input);
            // possible cases for initial input
            switch (input) {
                case 0:
                    System.out.println("Exiting program... good bye");
                    exit = true;
                    break;

                case 1:
                    System.out.println("You are now inserting an item into the list.")
;

                    System.out.print("Enter item: ");
                    Object item = stdin.readLine();
                    System.out.println(item);

                    System.out.print("Enter the position to enter the item
in: ");

                    pos = Integer.parseInt(stdin.readLine());
                    System.out.println(pos);
                    if (pos <= list_plus.size())
                    {
                        list_plus.add(pos, item);
                        System.out.println("Item " + item + " inserted in position " + p
os + " in the list.");
                    }

                    else
                    {
                        System.out.println("Position specified is out of range!");
                    }
                    break;

                case 2:
                    System.out.println("You are now removing an item from the
list.");

                    System.out.print("Enter position to remove item from: ");
                    pos = Integer.parseInt(stdin.readLine());
                    System.out.println(pos);
                    if (pos > list_plus.size() - 1)
                    {

```

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

```
0. Exit the 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: 1
You are now inserting an item into the list.
Enter item: Jean-Luc
Enter the position to enter the item in: 4
Position specified is out of range!
Select from the following menu:
0. Exit the 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 of size 2 has the following items: Beverly Data
Select from the following menu:
0. Exit the 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: 1
You are now inserting an item into the list.
Enter item: Jean-Luc
Enter the position to enter the item in: 2
Item Jean-Luc inserted in position 2 in the list.
Select from the following menu:
0. Exit the 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: 1
You are now inserting an item into the list.
Enter item: Geordi
Enter the position to enter the item in: 1
Item Geordi inserted in position 1 in the list.
Select from the following menu:
0. Exit the 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: 1
```

```
You are now inserting an item into the list.
Enter item: Worf
Enter the position to enter the item in: 3
Item Worf inserted in position 3 in the list.
Select from the following menu:
0. Exit the 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 of size 5 has the following items: Beverly Geordi Data Worf Jean-Luc
Select from the following menu:
0. Exit the 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: 6
Reversing list...
Reversed list:
Jean-Luc
```

Worf

Data

Geordi

Beverly

```
Select from the following menu:
0. Exit the 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 of size 5 has the following items: Jean-Luc Worf Data Geordi Beverly
Select from the following menu:
0. Exit the 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: 2
You are now removing an item from the list.
Enter position to remove item from: 5
Position specified is out of range!
Select from the following menu:
```

```
0. Exit the 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: 2
You are now removing an item from the list.
Enter position to remove item from: 3
Item Beverly removed from position 3 in the list.
Select from the following menu:
0. Exit the 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 of size 4 has the following items: Jean-Luc Worf Data Beverly
Select from the following menu:
0. Exit the 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: 2
You are now removing an item from the list.
Enter position to remove item from: 0
Item Worf removed from position 0 in the list.
Select from the following menu:
0. Exit the 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: 1
You are now inserting an item into the list.
Enter item: Will
Enter the position to enter the item in: 1
Item Will inserted in position 1 in the list.
Select from the following menu:
0. Exit the 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 of size 4 has the following items: Worf Will Data Beverly
Select from the following menu:
```

```
0. Exit the 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: 3
Enter position to retrieve item from: 2
Item Data retrieved from position 2 in the list.
Select from the following menu:
0. Exit the 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: 3
Enter position to retrieve item from: 0
Item Worf retrieved from position 0 in the list.
Select from the following menu:
0. Exit the 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: 3
Enter position to retrieve item from: 7
Position specified is out of range!
Select from the following menu:
0. Exit the 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 of size 4 has the following items: Worf Will Data Beverly
Select from the following menu:
0. Exit the 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: 6
Reversing list...
Reversed list:
Beverly
```

```
Data
```

```
Will
Worf

Select from the following menu:
0. Exit the 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 of size 4 has the following items: Beverly Data Will Worf
Select from the following menu:
0. Exit the 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: 4
Clearing list...
List cleared.
Select from the following menu:
0. Exit the 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.
Select from the following menu:
0. Exit the 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: 0
Exiting program... good bye
::::::::::::
ListArrayListBased.java
::::::::::::
/**
 * Purpose: Data Structure and Algorithms Review Programming Assignment
 * Status: Complete and thoroughly tested
 * Last update: 02/02/23
 * Submitted: 02/02/23
 * Comment: test suite and sample run attached
 * Comment: I declare that this is entirely my own work
 * @author: Antonio Rosado
 * @version: 2023.02.02
 */
```

```
import java.util.ArrayList;

public class ListArrayListBased implements ListInterface {
    ArrayList<Object> items;

    public ListArrayListBased()
    {
        items = new ArrayList<Object>();
    }

    /**
     *
     * Check if items ArrayList is empty.
     * @return items.isEmpty()
     */
    public boolean isEmpty()
    {
        return items.isEmpty();
    }

    /**
     *
     * Return size of ArrayList.
     * @return items.size()
     */
    public int size()
    {
        return items.size();
    }

    /**
     *
     * Add item to ArrayList.
     * @param int index    index of item
     * @param Object item  item Object
     */
    public void add(int index, Object item)
    {
        items.add(index, item);
    }

    /**
     *
     * Retrieve item in ArrayList by index.
     * @param int index    index of item
     * @return             item index
     * @throw              ListIndexOutOfBoundsException
     */
    public Object get(int index)
    {
        if(index >= 0 && index < items.size())
        {
            return items.get(index);
        }
        else
        {
            throw new ListIndexOutOfBoundsException("ListIndexOutOfBoundsException
on get");
        }
    }
}
```

```

/**
 * Remove item in ArrayList by index.
 * @param int index    index of item
 * @return             items.remove(index)
 * @throws             ListIndexOutOfBoundsException
 */
public Object remove(int index) throws ListIndexOutOfBoundsException
{
    return items.remove(index);
}

/**
 * Retrieve all items in ArrayList.
 * @param int index    index of item
 * @throws             ListIndexOutOfBoundsException
 */
public void removeAll(int index) throws ListIndexOutOfBoundsException
{
    items.removeAll(items);
}

@Override
public void removeAll() {
    // TODO Auto-generated method stub
}

}

:::::::::::::
ListArrayListBasedPlus.java
:::::::::::::
/**
 * Purpose: Data Structure and Algorithms Review Programming Assignment
 * Status: Complete and thoroughly tested
 * Last update: 02/02/23
 * Submitted: 02/02/23
 * Comment: test suite and sample run attached
 * Comment: I declare that this is entirely my own work
 * @author: Antonio Rosado
 * @version: 2023.02.02
 */

import java.util.ArrayList;

public class ListArrayListBasedPlus extends ListArrayListBased {

    /**
     * Reverses ArrayList if size cap is reached.
     */
    public void reverse()
    {
        ArrayList<Object> reversed = new ArrayList<Object> ();
        for(int index = items.size() -1; index >= 0; index--)
        {
            reversed.add(items.get(index));
        }
        items = reversed;
    }

}

/**

```

```

 * Returns a string value of item(s) in ArrayList
 */
public String toString()
{
    return items.toString();
}

}

:::::::::::::
Lab2P2Driver.java
:::::::::::::
import java.io.IOException;
import java.io.BufferedReader;
import java.io.InputStreamReader;
public class Lab2P2Driver extends ListArrayListBasedPlus{
    static BufferedReader stdin = new BufferedReader(new InputStreamReader(System.
in));
    public static void main (String[] args) throws IOException
    {
        ListArrayListBasedPlus list = new ListArrayListBasedPlus();
        boolean exit = false;
        int pos = -1;
        while (!exit) {
            System.out.println("Select from the following menu: \n"
                + "0. Exit the program \n"
                + "1. Insert item into the list \n"
                + "2. Remove item from the list \n"
                + "3. Get item from the list \n"
                + "4. Clear the list \n"
                + "5. Print size and content of the list \n"
                + "6. Reverse the list \n ");

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

            // possible cases for initial input
            switch (input) {
                case 0:
                    System.out.println("Exiting program... good bye");
                    exit = true;
                    break;

                case 1:
                    System.out.println("You are now inserting an item into the list.")

                    System.out.print("Enter item: ");
                    Object item = stdin.readLine();
                    System.out.println(item);

                    System.out.print("Enter the position to enter the item
in: ");

                    pos = Integer.parseInt(stdin.readLine());
                    System.out.println(pos);
                    if(pos <= list.size())
                    {
                        list.add(pos, item);
                        System.out.println("Item " + list.get(pos) + " inserted in posit
ion " + pos + " in the list.");
                    }

                    else
                    {

```



```

        System.out.println("Reversed list: ");
        for (int index = 0; index < list.size(); index++)
        {
            System.out.println(list.get(index) + "\n");
        }
        break;
    }
}

}

Lab2P2Sampleruns.txt
Select from the following menu:
0. Exit the 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.
Select from the following menu:
0. Exit the 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: 1
You are now inserting an item into the list.
Enter item: Data
Enter the position to enter the item in: 0
Item Data inserted in position 0 in the list.
Select from the following menu:
0. Exit the 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 of size 1 has the following items: [Data]
Select from the following menu:
0. Exit the 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: 1
You are now inserting an item into the list.
Enter item: Beverly
Enter the position to enter the item in: 0

```

Item Beverly inserted in position 0 in the list.

Select from the following menu:

0. Exit the 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 of size 2 has the following items: [Beverly, Data]

Select from the following menu:

0. Exit the 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: 1

You are now inserting an item into the list.

Enter item: Jean-Luc

Enter the position to enter the item in: 4

Position specified is out of range!

Select from the following menu:

0. Exit the 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 of size 2 has the following items: [Beverly, Data]

Select from the following menu:

0. Exit the 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: 1

You are now inserting an item into the list.

Enter item: Jean-Luc

Enter the position to enter the item in: 2

Item Jean-Luc inserted in position 2 in the list.

Select from the following menu:

0. Exit the 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: 1

You are now inserting an item into the list.

Enter item: Geordi

Enter the position to enter the item in: 1

Item Geordi inserted in position 1 in the list.

Select from the following menu:

0. Exit the 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: 1

You are now inserting an item into the list.

Enter item: Worf

Enter the position to enter the item in: 3

Item Worf inserted in position 3 in the list.

Select from the following menu:

0. Exit the 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 of size 5 has the following items: [Beverly, Geordi, Data, Worf, Jean-Luc]

Select from the following menu:

0. Exit the 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: 6

Reversing list...

Reversed list:

Jean-Luc

Worf

Data

Geordi

Beverly

Select from the following menu:

0. Exit the 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 of size 5 has the following items: [Jean-Luc, Worf, Data, Geordi, Beverly]

Select from the following menu:

```
0. Exit the 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: 2
You are now removing an item from the list.
Enter posiiton to remove item from: 5
Position specified out of range!
Select from the following menu:
0. Exit the 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: 2
You are now removing an item from the list.
Enter posiiton to remove item from: 3
Item Beverly removed from the list.
Select from the following menu:
0. Exit the 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 of size 4 has the following items: [Jean-Luc, Worf, Data, Beverly]
Select from the following menu:
0. Exit the 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: 2
You are now removing an item from the list.
Enter posiiton to remove item from: 0
Item Worf removed from the list.
Select from the following menu:
0. Exit the 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: 1
You are now inserting an item into the list.
Enter item: Will
Enter the position to enter the item in: 1
```

```
Item Will inserted in position 1 in the list.
Select from the following menu:
0. Exit the 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 of size 4 has the following items: [Worf, Will, Data, Beverly]
Select from the following menu:
0. Exit the 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: 3
Enter position to retrieve item from:
Item Data retrieved from position 2 in the list.
Select from the following menu:
0. Exit the 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: 3
Enter position to retrieve item from:
Item Worf retrieved from position 0 in the list.
Select from the following menu:
0. Exit the 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: 3
Enter position to retrieve item from:
Position specified is out of range!
Select from the following menu:
0. Exit the 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 of size 4 has the following items: [Worf, Will, Data, Beverly]
Select from the following menu:
0. Exit the 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: 6
Reversing list...
Reversed list:
Beverly

Data

Will

Worf

- Select from the following menu:
0. Exit the 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 of size 4 has the following items: [Beverly, Data, Will, Worf]
Select from the following menu:

0. Exit the 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: 4
Clearing list...
List cleared.
Select from the following menu:

0. Exit the 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 of size 4 has the following items: [Beverly, Data, Will, Worf]
Select from the following menu:

0. Exit the 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: 0
Exiting program... good bye