ArrayList in java with example programs – Collections Framework

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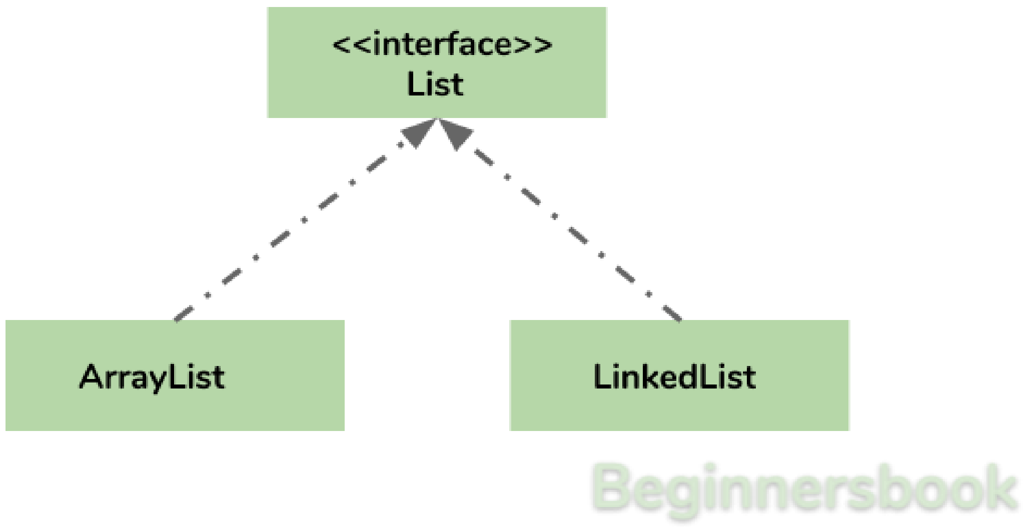
Arraylist class implements List interface and it is based on an Array data structure. It is widely used because of the functionality and flexibility it offers. Most of the developers **choose Arraylist over Array** as it's a very good alternative of traditional java arrays. ArrayList is a resizable-array implementation of the `List` interface. It implements all optional list operations, and permits all elements, including `null`.

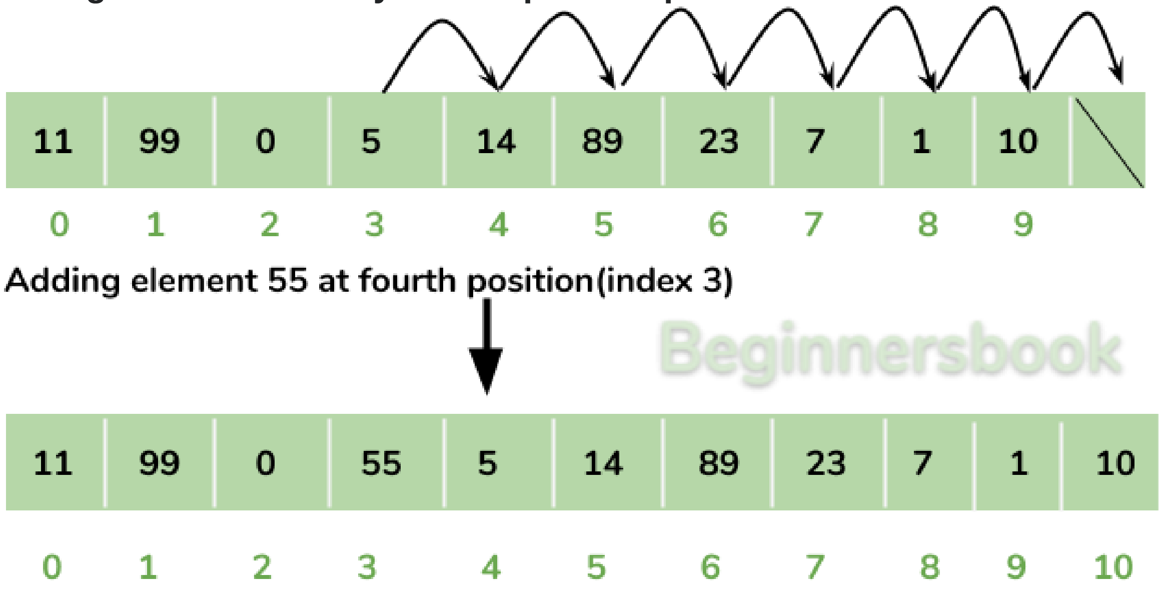


Why ArrayList is better than Array?

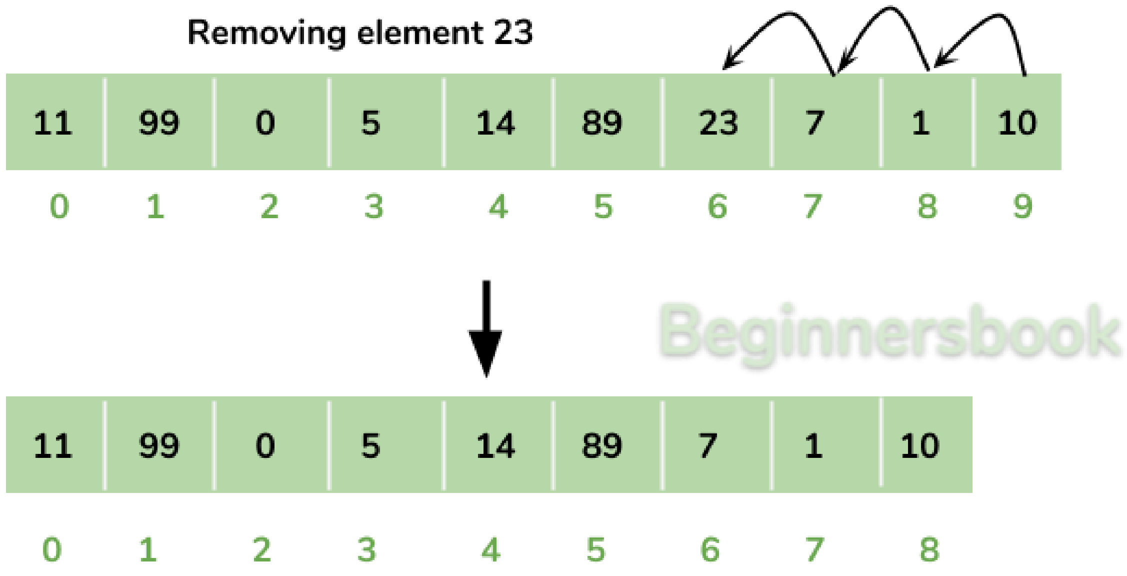
The limitation with array is that it has a fixed length so if it is full you cannot add any more elements to it, likewise if there are number of elements gets removed from it the memory consumption would be the same as it doesn't shrink.

On the other ArrayList can dynamically grow and shrink after addition and removal of elements (See the images below). Apart from these benefits ArrayList class enables us to use predefined methods of it which makes our task easy. Let's see the diagrams to understand the addition and removal of elements from ArrayList and then we will see the programs.

Adding Element in ArrayList at specified position:



Removing Element from ArrayList:



There is a list of several tutorials on ArrayList at the end of this guide, refer it to understand and learn ArrayList concept fully.

How to create an ArrayList?

We can create an ArrayList by writing a simple statement like this:

This statement creates an ArrayList with the name `alist` with type "String". The type determines which type of elements the list will have. Since this list is of

“String” type, the elements that are going to be added to this list will be of type “String”.

```
ArrayList<String> alist=new ArrayList<String>();
```

Similarly we can create ArrayList that accepts int elements.

```
ArrayList<Integer> list=new ArrayList<Integer>();
```

How to add elements to an ArrayList?

We add elements to an ArrayList by using add() method, this method has couple of variations, which we can use based on the requirement. For example: If we want to add the element at the end of the List then simply do it like this:

```
alist.add("Steve"); //This will add "Steve" at the end of List
```

To add the element at the specified location in ArrayList, we can specify the index in the add method like this:

```
alist.add(3, "Steve"); //This will add "Steve" at the fourth position
```

Lets write the complete code:

```
import java.util.*;
class JavaExample{
   public static void main(String args[]){
      ArrayList<String> alist=new ArrayList<String>();
      alist.add("Steve");
      alist.add("Tim");
      alist.add("Lucy");
      alist.add("Pat");
      alist.add("Angela");
      alist.add("Tom");

      //displaying elements
      System.out.println(alist);

      //Adding "Steve" at the fourth position
      alist.add(3, "Steve");

      //displaying elements
      System.out.println(alist);
   }
}
```

Output:

```
[Steve, Tim, Lucy, Pat, Angela, Tom]
[Steve, Tim, Lucy, Steve, Pat, Angela, Tom]
```

Note: Since the index starts with 0, index 3 would represent fourth position not 3.

How to remove elements from ArrayList?

We use remove() method to remove elements from an ArrayList, Same as add() method, this method also has few variations.

For example:

```
import java.util.*;
class JavaExample{
   public static void main(String args[]){
      ArrayList<String> alist=new ArrayList<String>();
      alist.add("Steve");
      alist.add("Tim");
      alist.add("Lucy");
      alist.add("Pat");
      alist.add("Angela");
      alist.add("Tom");

      //displaying elements
      System.out.println(alist);

      //Removing "Steve" and "Angela"
      alist.remove("Steve");
      alist.remove("Angela");

      //displaying elements
      System.out.println(alist);

      //Removing 3rd element
      alist.remove(2);

      //displaying elements
      System.out.println(alist);
   }
}
```

Output:

```
[Steve, Tim, Lucy, Pat, Angela, Tom]
[Tim, Lucy, Pat, Tom]
[Tim, Lucy, Tom]
```

Iterating ArrayList

In the above examples, we have displayed the ArrayList elements just by referring the ArrayList instance, which is definitely not the right way to displays the elements. The correct way of displaying the elements is by using an advanced for loop like this.

```
import java.util.*;
class JavaExample{
  public static void main(String args[]){
     ArrayList<String> alist=new ArrayList<String>();
     alist.add("Gregor Clegane");
     alist.add("Khal Drogo");
     alist.add("Cersei Lannister");
     alist.add("Sandor Clegane");
     alist.add("Tyrion Lannister");

     //iterating ArrayList
     for(String str:alist)
        System.out.println(str);
     }
}
```

Output:

```
Gregor Clegane
Khal Drogo
Cersei Lannister
Sandor Clegane
Tyrion Lannister
```

ArrayList Example in Java

This example demonstrates how to create, initialize, add and remove elements from ArrayList. In this example we have an ArrayList of type “String”. We have added 5 String element in the ArrayList using the method add(String E), this method adds the element at the end of the ArrayList.

We are then adding two more elements in the ArrayList using method add(int index, String E), this method adds the specified element at the specified index, index 0 indicates first position and 1 indicates second position.

We are then removing the elements “Chaitanya” and “Harry” from the ArrayList and then we are removing the second element of the ArrayList using method remove(int index). Since we have specified the index as 1 (remove(1)), it would remove the second element.

```
import java.util.*;

public class JavaExample {
   public static void main(String args[]) {
      /* Creating ArrayList of type "String" which means
       * we can only add "String" elements
       */
      ArrayList<String> obj = new ArrayList<String>();

      /*This is how we add elements to an ArrayList*/
      obj.add("Ajeet");
      obj.add("Harry");
      obj.add("Chaitanya");
      obj.add("Steve");
      obj.add("Anuj");

      // Displaying elements
      System.out.println("Original ArrayList:");
      for(String str:obj)
```

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

      /* Add element at the given index
       * obj.add(0, "Rahul") - Adding element "Rahul" at first position
       * obj.add(1, "Justin") - Adding element "Justin" at second position
       */
      obj.add(0, "Rahul");
      obj.add(1, "Justin");

      // Displaying elements
      System.out.println("ArrayList after add operation:");
      for(String str:obj)
         System.out.println(str);

      //Remove elements from ArrayList like this
      obj.remove("Chaitanya"); //Removes "Chaitanya" from ArrayList
      obj.remove("Harry"); //Removes "Harry" from ArrayList

      // Displaying elements
      System.out.println("ArrayList after remove operation:");
      for(String str:obj)
         System.out.println(str);

      //Remove element from the specified index
      obj.remove(1); //Removes Second element from the List

      // Displaying elements
      System.out.println("Final ArrayList:");
      for(String str:obj)
         System.out.println(str);
   }
}
```

Output:

```
Original ArrayList:
Ajeet
Harry
Chaitanya
Steve
Anuj
ArrayList after add operation:
Rahul
Justin
Ajeet
Harry
Chaitanya
Steve
Anuj
ArrayList after remove operation:
Rahul
Justin
Ajeet
Steve
Anuj
Final ArrayList:
Rahul
Ajeet
Steve
Anuj
```

Methods of ArrayList class

In the above example we have used methods such as add() and remove(). However there are number of methods available which can be used directly using object of ArrayList class. Let's discuss few important methods of ArrayList class.

1) **add(Object o)**: This method adds an object o to the arraylist.

```
obj.add("hello");
```

This statement would add a string hello in the arraylist at last position.

2) **add(int index, Object o)**: It adds the object o to the array list at the given index.

```
obj.add(2, "bye");
```

It will add the string bye to the 2nd index (3rd position as the array list starts with index 0) of array list.

3) **remove(Object o)**: Removes the object o from the ArrayList.

```
obj.remove("Chaitanya");
```

This statement will remove the string "Chaitanya" from the ArrayList.

4) **remove(int index)**: Removes element from a given index.

```
obj.remove(3);
```

It would remove the element of index 3 (4th element of the list – List starts with o).

5) **set(int index, Object o)**: Used for updating an element. It replaces the element present at the specified index with the object o.

```
obj.set(2, "Tom");
```

It would replace the 3rd element (index =2 is 3rd element) with the value Tom.

6) **int indexOf(Object o)**: Gives the index of the object o. If the element is not found in the list then this method returns the value -1.

```
int pos = obj.indexOf("Tom");
```

This would give the index (position) of the string Tom in the list.

7) **Object get(int index)**: It returns the object of list which is present at the specified index.

```
String str= obj.get(2);
```

Function get would return the string stored at 3rd position (index 2) and would be assigned to the string "str". We have stored the returned value in string variable because in our example we have defined the ArrayList is of String type. If you are having integer array list then the returned value should be stored in an integer variable.

8) **int size()**: It gives the size of the ArrayList – Number of elements of the list.

```
int numberofitems = obj.size();
```

9) **boolean contains(Object o)**: It checks whether the given object o is present in the array list if its there then it returns true else it returns false.

```
obj.contains("Steve");
```

It would return true if the string "Steve" is present in the list else we would get false.

10) **clear():** It is used for removing all the elements of the array list in one go. The below code will remove all the elements of ArrayList whose object is obj.

```
obj.clear();
```

Java ArrayList Tutorials

Here is the list of **ArrayList** tutorials published on beginnersbook.com.

ArrayList Basics

- Initialize ArrayList
- Loop ArrayList
- Find length of ArrayList

Sorting

- Sort ArrayList
- Sort ArrayList in Descending order
- Sort ArrayList of Objects using Comparable and Comparator

Add/Remove

- Add element to ArrayList
- Add element at particular index of ArrayList

- Append Collection elements to ArrayList
- Copy All List elements to ArrayList
- Insert all the collection elements to the specified position in ArrayList
- Remove element from the specified index in ArrayList
- Remove specified element from ArrayList

Get/Search

- Get Sub List of ArrayList
- Get the index of last occurrence of the element in the ArrayList
- Get element from ArrayList
- Get the index of first occurrence of the element in the ArrayList
- Check whether element exists in ArrayList

Other Tutorials on ArrayList

- Compare two ArrayList
- Synchronize ArrayList
- Swap two elements in ArrayList
- Override toString() method – ArrayList
- Serialize ArrayList
- Join two ArrayList
- Clone ArrayList to another ArrayList
- Make ArrayList Empty
- Check whether ArrayList is empty or not
- Trim the Size of ArrayList
- Replace the value of existing element in ArrayList
- Increase the capacity(size) of ArrayList

Conversions:

- Convert LinkedList to ArrayList
- Convert Vector to ArrayList
- Convert ArrayList to String Array
- Convert Array to ArrayList
- Convert HashSet to ArrayList

Differences:

- ArrayList vs Vector
- ArrayList vs HashMap
- ArrayList vs LinkedList

Reference

- ArrayList Documentation