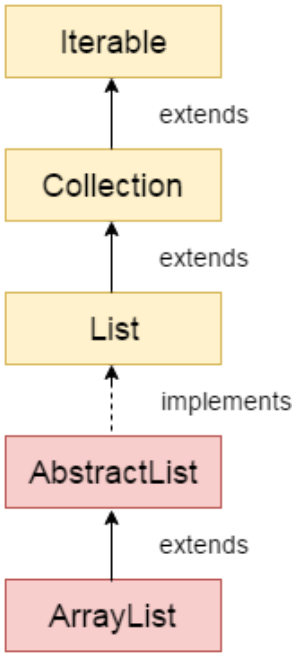
# Java ArrayList class

Java ArrayList class uses a dynamic array for storing the elements. It inherits AbstractList class and implements List interface.




The important points about Java ArrayList class are:

- Java ArrayList class can contain duplicate elements.
- Java ArrayList class maintains insertion order.
- Java ArrayList class is non synchronized.
- Java ArrayList allows random access because array works at the index basis.
- In Java ArrayList class, manipulation is slow because a lot of shifting needs to be occurred if any element is removed from the array list.

## Hierarchy of ArrayList class

As shown in above diagram, Java ArrayList class extends AbstractList class which implements List interface. The List interface extends Collection and Iterable interfaces in hierarchical order.

## ArrayList class declaration

Let's see the declaration for java.util.ArrayList class.

```
public class ArrayList<E> extends AbstractList<E> implements List<E>, RandomAccess, Cloneable, Serializable
```

## Constructors of Java ArrayList

| Constructor | Description |
|---|---|
| ArrayList() | It is used to build an empty array list. |
| ArrayList(Collection c) | It is used to build an array list that is initialized with the elements of the collection c. |
| ArrayList(int capacity) | It is used to build an array list that has the specified initial capacity. |

## Methods of Java ArrayList

| Method | Description |
|---|---|
| void add(int index, Object element) | It is used to insert the specified element at the specified position index in a list. |

| | |
|---|---|
| boolean addAll(Collection c) | It is used to append all of the elements in the specified collection to the end of this list, in the order that they are returned by the specified collection's iterator. |
| void clear() | It is used to remove all of the elements from this list. |
| int lastIndexOf(Object o) | It is used to return the index in this list of the last occurrence of the specified element, or -1 if the list does not contain this element. |
| Object[] toArray() | It is used to return an array containing all of the elements in this list in the correct order. |
| Object[] toArray(Object[] a) | It is used to return an array containing all of the elements in this list in the correct order. |
| boolean add(Object o) | It is used to append the specified element to the end of a list. |
| boolean addAll(int index, Collection c) | It is used to insert all of the elements in the specified collection into this list, starting at the specified position. |
| Object clone() | It is used to return a shallow copy of an ArrayList. |
| int indexOf(Object o) | It is used to return the index in this list of the first occurrence of the specified element, or -1 if the List does not contain this element. |
| void trimToSize() | It is used to trim the capacity of this ArrayList instance to be the list's current size. |

# Java Non-generic Vs Generic Collection

Java collection framework was non-generic before JDK 1.5. Since 1.5, it is generic.

Java new generic collection allows you to have only one type of object in collection. Now it is type safe so typecasting is not required at run time.

Let's see the old non-generic example of creating java collection.

```
ArrayList al=new ArrayList();//creating old non-generic arraylist
```

Let's see the new generic example of creating java collection.

```
ArrayList<String> al=new ArrayList<String>();//creating new generic arraylist
```

In generic collection, we specify the type in angular braces. Now ArrayList is forced to have only specified type of objects in it. If you try to add another type of object, it gives *compile time error*.

For more information of java generics, click here Java Generics Tutorial.

## Java ArrayList Example

```
import java.util.*;
class TestCollection1{
 public static void main(String args[]){
  ArrayList<String> list=new ArrayList<String>();//Creating arraylist
  list.add("Ravi");//Adding object in arraylist
  list.add("Vijay");
  list.add("Ravi");
  list.add("Ajay");
  //Traversing list through Iterator
  Iterator itr=list.iterator();
  while(itr.hasNext()){
   System.out.println(itr.next());
  }
 }
}
```

**Test it Now**

```
Ravi
Vijay
Ravi
Ajay
```

## Two ways to iterate the elements of collection in java

There are two ways to traverse collection elements:

1. By Iterator interface.
2. By for-each loop.

In the above example, we have seen traversing ArrayList by Iterator. Let's see the example to traverse ArrayList elements using for-each loop.

## Iterating Collection through for-each loop

```
import java.util.*;
class TestCollection2{
 public static void main(String args[]){
  ArrayList<String> al=new ArrayList<String>();
  al.add("Ravi");
  al.add("Vijay");
  al.add("Ravi");
  al.add("Ajay");
  for(String obj:al)
    System.out.println(obj);
 }
}
```

**Test it Now**

```
Ravi
Vijay
Ravi
Ajay
```

## User-defined class objects in Java ArrayList

Let's see an example where we are storing Student class object in array list.

```
class Student{
  int rollno;
  String name;
  int age;
  Student(int rollno,String name,int age){
   this.rollno=rollno;
   this.name=name;
   this.age=age;
  }
}
```

```
import java.util.*;
public class TestCollection3{
 public static void main(String args[]){
  //Creating user-defined class objects
  Student s1=new Student(101,"Sonoo",23);
  Student s2=new Student(102,"Ravi",21);
```

```
  Student s2=new Student(103,"Hanumat",25);
  //creating arraylist
  ArrayList<Student> al=new ArrayList<Student>();
  al.add(s1);//adding Student class object
  al.add(s2);
  al.add(s3);
  //Getting Iterator
  Iterator itr=al.iterator();
  //traversing elements of ArrayList object
  while(itr.hasNext()){
    Student st=(Student)itr.next();
    System.out.println(st.rollno+" "+st.name+" "+st.age);
  }
 }
}
```

**Test it Now**

```
101 Sonoo 23
102 Ravi 21
103 Hanumat 25
```

## Example of addAll(Collection c) method

```
import java.util.*;
class TestCollection4{
 public static void main(String args[]){
  ArrayList<String> al=new ArrayList<String>();
  al.add("Ravi");
  al.add("Vijay");
  al.add("Ajay");
  ArrayList<String> al2=new ArrayList<String>();
  al2.add("Sonoo");
  al2.add("Hanumat");
  al.addAll(al2);//adding second list in first list
  Iterator itr=al.iterator();
  while(itr.hasNext()){
   System.out.println(itr.next());
  }
 }
}
```

**Test it Now**

```
Ravi
Vijay
Ajay
Sonoo
Hanumat
```

## Example of removeAll() method

```
import java.util.*;
class TestCollection5{
 public static void main(String args[]){
  ArrayList<String> al=new ArrayList<String>();
  al.add("Ravi");
  al.add("Vijay");
  al.add("Ajay");
  ArrayList<String> al2=new ArrayList<String>();
  al2.add("Ravi");
  al2.add("Hanumat");
  al.removeAll(al2);
  System.out.println("iterating the elements after removing the elements of al2...");
  Iterator itr=al.iterator();
  while(itr.hasNext()){
   System.out.println(itr.next());
  }

  }
}
```

**Test it Now**

```
iterating the elements after removing the elements of al2...
Vijay
Ajay
```

## Example of retainAll() method

```
import java.util.*;
```

```
class TestCollection6{
 public static void main(String args[]){
  ArrayList<String> al=new ArrayList<String>();
  al.add("Ravi");
  al.add("Vijay");
  al.add("Ajay");
  ArrayList<String> al2=new ArrayList<String>();
  al2.add("Ravi");
  al2.add("Hanumat");
  al.retainAll(al2);
  System.out.println("iterating the elements after retaining the elements of al2...");
  Iterator itr=al.iterator();
  while(itr.hasNext()){
   System.out.println(itr.next());
  }
 }
}
```

**Test it Now**

```
iterating the elements after retaining the elements of al2...
Ravi
```

## Java ArrayList Example: Book

Let's see an ArrayList example where we are adding books to list and printing all the books.

```
import java.util.*;
class Book {
int id;
String name,author,publisher;
int quantity;
public Book(int id, String name, String author, String publisher, int quantity) {
    this.id = id;
    this.name = name;
    this.author = author;
    this.publisher = publisher;
    this.quantity = quantity;
}
}
public class ArrayListExample {
```

```
public static void main(String[] args) {
    //Creating list of Books
    List<Book> list=new ArrayList<Book>();
    //Creating Books
    Book b1=new Book(101,"Let us C","Yashwant Kanetkar","BPB",8);
    Book b2=new Book(102,"Data Communications & Networking","Forouzan","Mc Graw Hill",4);
    Book b3=new Book(103,"Operating System","Galvin","Wiley",6);
    //Adding Books to list
    list.add(b1);
    list.add(b2);
    list.add(b3);
    //Traversing list
    for(Book b:list){
        System.out.println(b.id+" "+b.name+" "+b.author+" "+b.publisher+" "+b.quantity);
    }
}
}
```

**Test it Now**

Output:

```
101 Let us C Yashwant Kanetkar BPB 8
102 Data Communications & Networking Forouzan Mc Graw Hill 4
103 Operating System Galvin Wiley 6
```

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