ArrayList Programs

```
package UNIT4;
/*Demonstrate ArrayList.An array list is created for objects of type String, and
then several strings are added to it. The list is then displayed. Some of the
elements are removed and the list is displayed again.*/
import java.util.*;
class ArrayListDemo {
public static void main(String args[]) {
// Create an array list.
ArrayList<String> al = new ArrayList<String>();
System.out.println("Initial size of al: " + al.size());
// Add elements to the array list.
al.add("C");
al.add("A");
al.add("E");
al.add("B");
al.add("D");
al.add("F");
al.add(1, "A2");
System.out.println("Size of al after additions: " + al.size());
// Display the array list.
System.out.println("Contents of al: " + al);
// Remove elements from the array list.
al.remove("F");
al.remove(2);
System.out.println("Size of al after deletions: " + al.size());
System.out.println("Contents of al: " + al);
}
}
```

Output

```
Initial size of al: 0
Size of al after additions: 7
Contents of al: [C, A2, A, E, B, D, F]
Size of al after deletions: 5
Contents of al: [C, A2, E, B, D]
```

```
package UNIT4;
/* Create an Arraylist of 5 fruits,display, update fruit in position 1 to "Dates",
 *  sort the list and display  */
import java.util.*;
public class ArrayListFruits{
 public static void main(String args[]){
  ArrayList<String> list=new ArrayList<String>();//Creating arraylist
  list.add("Mango");//Adding object in arraylist
  list.add("Apple");
  list.add("Banana");
  list.add("Grapes");
  //Traversing list through Iterator
  Iterator itr=list.iterator();//getting the Iterator
```

```
  while(itr.hasNext()){//check if iterator has the elements
   System.out.println(itr.next());//printing the element and move to next
  }
//changing the element
  list.set(1,"Dates");
  System.out.println("------------------------");
  //Traversing list through for-each loop
  System.out.println("------------------------");
//Sorting the list
  Collections.sort(list);
   //Traversing list through the for-each loop
  for(String fruit:list)
    System.out.println(fruit);
 }
}
```

Output

```
Mango
Apple
Banana
Grapes
------------------------
------------------------
Banana
Dates
Grapes
Mango
---------------------------
```

```
package UNIT4;
/* create an Arraylist of programming languages, traverse the list to display the
 * elements using :
 *(i)Iterator
 *(ii)List Iterator in reverse order and
 *(iii) for
 *(iv) for each*/
import java.util.*;
class ArrayListTraversal{
 public static void main(String args[]){
    ArrayList<String> list=new ArrayList<String>();//Creating arraylist
          list.add("Java");//Adding object in arraylist
          list.add("Python");
          list.add("C++");
          list.add("C");
          System.out.println("Traversing list through List Iterator :");
          Iterator itr=list.iterator();
          while(itr.hasNext()){//check if iterator has the elements
             System.out.println(itr.next());//printing the element and move to next
            }
          System.out.println("Traversing list through List Iterator in reverse:");
          //Here, element iterates in reverse order
            ListIterator<String> list1=list.listIterator(list.size());
```

```
            while(list1.hasPrevious())
            {
               String str=list1.previous();
               System.out.println(str);
            }

        System.out.println("Traversing list through for loop:");
          for(int i=0;i<list.size();i++)
          {
           System.out.println(list.get(i));
          }

        System.out.println("Traversing list through forEach() method:");
        for(String lan:list)
           System.out.println(lan);
         }
}
```

Output

```
Traversing list through List Iterator :
Java
Python
C++
C
Traversing list through List Iterator in reverse:
C
C++
Python
Java
Traversing list through for loop:
Java
Python
C++
C
Traversing list through forEach() method:
Java
Python
C++
C
```

```
package UNIT4;
/*CREATE AN ARRAYLIST OF STUDENT CLASS OBJECTS, TRAVERSE USING AN
ITERATOR AND DISPLAY */
import java.util.*;
class Student{
            int rollno;
            String name;
            int age;
            Student(int rollno,String name,int age){
             this.rollno=rollno;
             this.name=name;
```

```
            this.age=age;
           }
          }
class StudentArrayList{
public static void main(String args[]){
 //Creating user-defined class objects
 Student s1=new Student(101,"XXX",18);
 Student s2=new Student(102,"YYY",19);
 Student s3=new Student(103,"ZZZ",20);
 //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);
 }
}
}
```

Output

```
101 XXX 18
102 YYY 19
103 ZZZ 20
```

```
package UNIT4;
import java.util.*;
class Student1
{
        int rollno;
        String name ;
        int age ;
        public Student1(int r , String n , int a)
        {
                rollno = r ;
                name = n ;
                age = a ;
        }
        public String toString()
        {
                return (name+" "+rollno+" "+age);
        }
}

public class StudentSearch{
        public static void main(String args[])
        {
```

```
                Student1 s1 = new Student1(100,"xxx",13);
                Student1 s2 = new Student1(200,"yyy",18);
                Student1 s3 = new Student1(300,"zzz",29);
                ArrayList<Student1> al = new ArrayList<Student1>();
                al.add(s1);
                al.add(s2);
                al.add(s3);
        Iterator it = al.iterator();
                while(it.hasNext())
                {
                        System.out.println(it.next());
                }
                int key ;
                Scanner in=new Scanner(System.in);
                System.out.print("Enter Key: ");
                key=in.nextInt();
                int f=0;
                for(Student1 s:al)
                {
                        if(s.rollno==key) {f=1;
                        System.out.println("Student  Deatails    :"+ s );}
                }
                if(f==0)
                        System.out.println("Student does not exist");

        }
}
```

Output

```
xxx 100 13
yyy 200 18
zzz 300 29
Enter Key: 200
Student  Deatails    :yyy 200 18

xxx 100 13
yyy 200 18
zzz 300 29
Enter Key: 500
Student does not exist
```

```
package UNIT4;
/*array to arraylist*/
import java.util.ArrayList;
import java.util.Arrays;
public class ArraToArrayList {
public static void  main(String[] args)
{
String[]  my_array = new String[] {"Python", "JAVA", "PHP",  "Perl", "C#", "C++"};
ArrayList<String>  list = new ArrayList<String>(Arrays.asList(my_array));
```

```
System.out.println(list);
}
}
```

Output

[Python, JAVA, PHP, Perl, C#, C++]

```
package UNIT4;
/* Create an ArrayList of 3 books and perform the following operations. Books contain the
field:
 * id, title, author , publisher and quantity
 *  (i) Display books
 *  (ii)sort books by id
 *  (iii) search for a book by id
 *  (iv)Remove a book with given title*/
import java.util.*;
class Book {
int id;
String title,author,publisher;
int quantity;
public Book(int id, String title, String author, String publisher, int quantity) {
   this.id = id;
   this.title = title;
   this.author = author;
   this.publisher = publisher;
   this.quantity = quantity;
}
Integer getid()
{return id;}
public String toString() {
        return(id+"    "+title+"    "+author+"    "+ publisher+"    "+quantity);
        }
}
public class BookArrayKist {
        public static void main(String[] args) {
   //Creating list of Books
   ArrayList<Book> list=new ArrayList<Book>();
   //Creating Books
   Book b1=new Book(222,"Let us C","Yashwant Kanetkar","BPB",8);
   Book b2=new Book(555,"Data Communications and Networking","Forouzan","Mc Graw
Hill",4);
   Book b3=new Book(111,"Operating System","Galvin","Wiley",6);
   //Adding Books to list
   list.add(b1);
   list.add(b2);
   list.add(b3);
   int option, key ;
   Scanner in=new Scanner(System.in);
   System.out.print("1. Display Books" + "\t"+ "2. Sort Boooks"+"\t "+"3.Search"+"\t"+"4.
Remove");
```

```
    System.out.println() ;
    for(;;) {
    System.out.print("Enter the option: ");
    option=in.nextInt();
    switch(option)
    {
    case 1:
          //Display Books
          for(Book b:list)
          System.out.println(b);
          break;
    case 2:
              list.sort((o1, o2)
                        -> o1.getid().compareTo(
                           o2.getid()));
              //System.out.println("Sorted List  "+list);
                    break;
    case 3:
                  System.out.print("Enter Key: ");
                  key=in.nextInt();
                  int f=0;
                  for(Book b:list)
                  {
                        if(b.id==key) {f=1;
                        System.out.println("Book  Deatails    :"+ b );}
                  }
                  if(f==0)
                        System.out.println("Book does not exist");
                  break;
    case 4:System.out.print("Enter the title: ");
          in.nextLine();
          String t=in.nextLine();
          int f1=0;
          Iterator<Book> iter = list.iterator();
          while(iter.hasNext()){
             if(iter.next().title.equals(t)) {f1=1;
                iter.remove();
                System.out.println("Book Removed");
          }
             }
          if(f1==0)
                System.out.println("Book does not exist");
          break;
           default:System.out.println("Invalid option");
                 return;
           }
}
}
}
```

Output

```
1. Display Books        2. Sort Boooks 3.Search        4. Remove
Enter the option: 1
222    Let us C    Yashwant Kanetkar    BPB    8
555    Data Communications and Networking    Forouzan    Mc Graw Hill    4
111    Operating System    Galvin    Wiley    6
Enter the option: 2
Enter the option: 1
111    Operating System    Galvin    Wiley    6
222    Let us C    Yashwant Kanetkar    BPB    8
555    Data Communications and Networking    Forouzan    Mc Graw Hill    4
Enter the option: 3
Enter Key: 111
Book  Deatails    :111    Operating System    Galvin    Wiley    6
Enter the option: 4
Enter the title: Let us C
Book Removed
Enter the option: 7
Invalid option
```

LinkedList Programs

```
package UNIT4;

//Demonstrate LinkedList.
import java.util.*;
class LinkedListDemo {
public static void main(String args[]) {
// Create a linked list.
LinkedList<String> ll = new LinkedList<String>();
// Add elements to the linked list.
ll.add("F");
ll.add("B");
ll.add("D");
ll.add("E");
ll.add("C");
ll.addLast("Z");
ll.addFirst("A");
ll.add(1, "A2");
System.out.println("Original contents of ll: " + ll);
// Remove elements from the linked list.
ll.remove("F");
ll.remove(2);
System.out.println("Contents of ll after deletion: " + ll);
//Remove first and last elements.
ll.removeFirst();
ll.removeLast();
System.out.println("ll after deleting first and last: " + ll);
// Get and set a value.
String val = ll.get(2);
```

```
ll.set(2, val + " Changed");
System.out.println("ll after change: " + ll);
//Traversing the list of elements in reverse order
System.out.println("Traversing the list of elements in reverse order");
Iterator i=ll.descendingIterator();
while(i.hasNext())
{
   System.out.println(i.next());
}
}
}
```

Output

```
Original contents of ll: [A, A2, F, B, D, E, C, Z]
Contents of ll after deletion: [A, A2, D, E, C, Z]
ll after deleting first and last: [A2, D, E, C]
ll after change: [A2, D, E Changed, C]
Traversing the list of elements in reverse order
C
E Changed
D
A2
```

```
package UNIT4;
/* linked list as Queue*/
import java.util.LinkedList;
  import java.util.Queue;
class QueLinkedList {
 public static void main(String[] args) {
   Queue<String> languages = new LinkedList<>();
   // add elements
   languages.add("Python");
   languages.add("Java");
   languages.add("C");
   System.out.println("LinkedList: " + languages);
   // access the first element
   String str1 = languages.peek();
   System.out.println("Accessed Element: " + str1);
   // access and remove the first element
   String str2 = languages.poll();
   System.out.println("Removed Element: " + str2);
   System.out.println("LinkedList after poll(): " + languages);
   // add element at the end
   languages.offer("Swift");
   System.out.println("LinkedList after offer(): " + languages);
 }
}
```

Output

```
LinkedList: [Python, Java, C]
Accessed Element: Python
```

```
Removed Element: Python
LinkedList after poll(): [Java, C]
LinkedList after offer(): [Java, C, Swift]
```

```
package UNIT4;
/* LinkedList as Dequeue*/
import java.util.LinkedList;
import java.util.Deque;
public class LinkedListDeque {
        public static void main(String[] args){
          Deque<String> animals = new LinkedList<>();
          // add element at the beginning
          animals.add("Cow");
          System.out.println("LinkedList: " + animals);
          animals.addFirst("Dog");
          System.out.println("LinkedList after addFirst(): " + animals);
          // add elements at the end
          animals.addLast("Zebra");
          System.out.println("LinkedList after addLast(): " + animals);
          // remove the first element
          animals.removeFirst();
          System.out.println("LinkedList after removeFirst(): " + animals);
          // remove the last element
          animals.removeLast();
          System.out.println("LinkedList after removeLast(): " + animals);
        }
      }
```

Output

```
LinkedList: [Cow]
LinkedList after addFirst(): [Dog, Cow]
LinkedList after addLast(): [Dog, Cow, Zebra]
LinkedList after removeFirst(): [Cow, Zebra]
LinkedList after removeLast(): [Cow]
```

```
package UNIT4;
/* To merge two Linked lists*/
import java.util.*;
public class mergeList{
 public static void main(String args[]){
 LinkedList<String> ll=new LinkedList<String>();
        System.out.println("Initial list of elements: "+ll);
        ll.add("AAA");
        ll.add("BBB");
        ll.add("CCC");
        System.out.println("List 1: "+ll);
        LinkedList<String> l2=new LinkedList<String>();
        l2.add("EEE");
        l2.add("FFF");
        System.out.println("List 2: "+l2);
        //Adding second list elements to the first list
```

```
        ll.addAll(l2);
        System.out.println("After merging List 1: "+ll);
         }
}
```

Output

```
Initial list of elements: []
List 1: [AAA, BBB, CCC]
List 2: [EEE, FFF]
After merging List 1: [AAA, BBB, CCC, EEE, FFF]
```

HashSet Programs

```
package UNIT4;
/* HashSet demo*/
import java.util.*;
class HashSet1{
 public static void main(String args[]){
  //Creating HashSet and adding elements
    HashSet<String> set=new HashSet();
        set.add("One");
        set.add("Two");
        set.add("Three");
        set.add("Four");
        set.add("Five");
        set.add("Three");
        Iterator<String> i=set.iterator();
        while(i.hasNext())
        {
        System.out.println(i.next());
        }
 }
}
```

Output

```
Five
One
Four
Two
Three
```

```
package UNIT4;
/* Merge 2 hashsets */
import java.util.*;
class HashSet2{
 public static void main(String args[]){
  HashSet<String> set2=new HashSet<String>();
        set2.add("XXX");
        set2.add("ZZZ");
        set2.add("YYY");
        set2.add("WWW");
```

```
        System.out.println("An initial list of elements: "+set2);
        //Removing specific element from HashSet
        //set.remove("ZZZ");
        //System.out.println("After invoking remove(ZZZ) method: "+set);
        HashSet<String> set1=new HashSet<String>();
        set1.add("AAA");
        set1.add("XXX");
        set2.addAll(set1);
        System.out.println("Updated List after Adda: "+set2);
        //Removing all the new elements from HashSet
        set2.removeAll(set1);
        System.out.println("After invoking removeAll() method: "+set2);
        //Removing elements on the basis of specified condition
        set2.removeIf(str->str.contains("YYY"));
        System.out.println("After invoking removeIf() method: "+set2);
        //Removing all the elements available in the set
        set1.clear();
        System.out.println("After invoking clear() method: "+set1 );
 }
}
```

Output

```
An initial list of elements: [WWW, YYY, XXX, ZZZ]
Updated List after Adda: [AAA, WWW, YYY, XXX, ZZZ]
After invoking removeAll() method: [WWW, YYY, ZZZ]
After invoking removeIf() method: [WWW, ZZZ]
After invoking clear() method: []
```

```
package UNIT4;
/* HashSet from ArrayList*/
import java.util.*;
class HashSetFromArrayList{
 public static void main(String args[]){
   ArrayList<String> list=new ArrayList<String>();
        list.add("XXX");
        list.add("YYY");
        list.add("ZZZ");
        list.add("XXX");
        System.out.println("Array List:" + list);
        HashSet<String> set=new HashSet(list);
        set.add("ZZZ");
        System.out.println("Hash set: "+ set);
         }
}
```

Output

```
Array List:[XXX, YYY, ZZZ, XXX]
Hash set: [YYY, XXX, ZZZ]
```

```
package UNIT4;
```

```
/* Create a HashSet of 3 books and perform the following operations. Books contain the
field:
 * id, title, author , publisher and quantity
 *  (i) Display books
 *  (ii) search for a book by id
 *  (iii)Remove a book with given title
 *  (IV) Sort Hash set*/
import java.util.*;
class Book2 {
int id;
String name,title,author,publisher;
int quantity;
public Book2(int id, String title, String author, String publisher, int quantity) {
   this.id = id;
   this.title = title;
   this.author = author;
   this.publisher = publisher;
   this.quantity = quantity;
}
Integer getid()
{return id;}
public String toString() {
          return(id+"    "+ title +"    "+author+"    "+ publisher+"    "+quantity);
          }
}
public class BookHashSet {
public static void main(String[] args) {
   HashSet<Book2> set=new HashSet<Book2>();
   //Creating Books
   Book2 b1=new Book2(101,"Let us C","Yashwant Kanetkar","BPB",8);
   Book2 b2=new Book2(102,"Data Communications & Networking","Forouzan","Mc Graw
Hill",4);
   Book2 b3=new Book2(103,"Operating System","Galvin","Wiley",6);
   //Adding Books to HashSet
   set.add(b1);
   set.add(b2);
   set.add(b3);
   set.add(b2);
   Scanner in=new Scanner(System.in);
   int option, key ;
   System.out.print("1. Display Books" + "\t"  +"2.Search"+"\t"+"3. Remove"+"\t"+"4.
Sort");
   System.out.println() ;
   for(;;) {
   System.out.print("Enter the option: ");
   option=in.nextInt();
   switch(option)
   {
   case 1:
        //Display Books
```

```
        for(Book2 b:set)
        System.out.println(b);
        break;
    case 2:
                System.out.print("Enter Key: ");
                key=in.nextInt();
                int f=0;
                for(Book2 b:set)
                {
                    if(b.id==key) {f=1;
                    System.out.println("Book  Deatails    :"+ b );}
                }
                if(f==0)
                    System.out.println("Book does not exist");
                break;
    case 3:System.out.print("Enter the title: ");
        in.nextLine();
        String t=in.nextLine();
        int f1=0;
        Iterator<Book2> iter = set.iterator();
        while(iter.hasNext()){
           if(iter.next().title.equals(t)) {f1=1;
            iter.remove();
            System.out.println("Book Removed");
        }
           }
        if(f1==0)
            System.out.println("Book does not exist");
        break;
    case 4:
         default:System.out.println("Invalid option");
              return;
         }
}
   }
}
```

Output

```
1. Display Books        2.Search        3. Remove       4. Sort
Enter the option: 1
102    Data Communications & Networking    Forouzan    Mc Graw Hill    4
101    Let us C    Yashwant Kanetkar    BPB    8
103    Operating System    Galvin    Wiley    6
Enter the option: 2
Enter Key: 101
Book  Deatails    :101    Let us C    Yashwant Kanetkar    BPB    8
Enter the option: 3
Enter the title: Let us C
Book Removed
Enter the option: 6
Invalid option
```