ArrayList

Computer Engineering

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ArrayList

- The ***ArrayList*** class is a resizable array, which can be found in the ***java.util*** package.
- It provides us with ***dynamic*** arrays in Java while elements can be added and removed from an ArrayList whenever you want.
- It is like an array, but there is no size limit. We can add or remove elements anytime. So, it is much more flexible than the traditional array.
- it may be slower than standard arrays but can be helpful in programs where lots of manipulation in the array is needed.
- The syntax of the built-in array and ArrayList are slightly different:
- For creating ArrayList we need to import the ArrayList class

```
import java.util.ArrayList; // import the ArrayList class
```

- Then in method we create the arrayList
- ArrayList<Type> ***name_of_ArrayList***=new ArrayList<Type>();

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

ArrayList: Methods

- There are several methods which we can use them with **arrayList**, below are some common methods:

Methods	Uses
add(value)	Add Item: to add elements to the ArrayList, use the add() method
get(index)	Access Item: To access an element in the ArrayList, use the get() method and refer to the index number
set(index,value)	To modify an element, use the set() method and refer to the index number
remove(index)	To remove an element, use the remove() method and refer to the index number
clear()	To remove all the elements in the ArrayList, use the clear() method
size()	To find out how many elements an ArrayList have, use the size method

ArrayList: Methods

1. Add Item

```
import java.util.ArrayList;
public class ArrayListExample {
    public static void main(String[] args) {
        ArrayList<String> cars=new ArrayList<String>();
       // add Elemnts to the arrayList
        cars.add("Volvo");
        cars.add("BMW");
        cars.add("Toyota");
        cars.add("Nissan");
        cars.add("Mazda");
        System.out.println("Array Elemts:\n"+cars);
```

```
Array Elemts:
[Volvo, BMW, Toyota, Nissan, Mazda]
```

2. Get Item

```
System.out.println(cars.get(2));
```

```
Toyota
```

3. Clear Items: Empty the arrayList

```
cars.clear();
```

```
Array Elements:
[]
```

4. Size of the arrayList

```
System.out.println("array size: "+ cars.size());
```

```
array size: 4
```

ArrayList: Methods

5. Modify Item

```
Array Elemts:
[Volvo, BMW, Toyota, Nissan, Mazda]
```

```
cars.set(0, "Ford");
System.out.println("Array Elements after modifying:\n"+cars);
```

```
Array Elements after modifying:
[Ford, BMW, Toyota, Nissan, Mazda]
```

6. Remove Item

```
Array Elemts:
[Volvo, BMW, Toyota, Nissan, Mazda]
```

```
cars.remove(2);
System.out.println("Array Elements after removing item in index 2:\n"+cars);
```

```
Array Elements after removing item in index 2:
[Volvo, BMW, Nissan, Mazda]
```

Example

```java
import java.util.ArrayList;
public class ArrayListExample {
    public static void main(String[] args) {
        ArrayList<String> cars=new ArrayList<String>();
       // add Elemnts to the arrayList
        cars.add("Volvo");
        cars.add("BMW");
        cars.add("Toyota");
        cars.add("Nissan");
        cars.add("Mazda");
        System.out.println("Array Elements:\n"+cars);
        System.out.println(cars.get(2));
        cars.set(0, "Ford");
        System.out.println("Array Elements after modifying:\n"+cars);
        cars.remove(2);
        System.out.println("Array Elements after removing item in index 2:\n"+cars);
        System.out.println("array size: "+ cars.size());
        cars.clear();
        System.out.println("Array Elements:\n"+cars);
    }
}
```

- **Output**

```
Array Elements:
[Volvo, BMW, Toyota, Nissan, Mazda]
Toyota
Array Elements after modifying:
[Ford, BMW, Toyota, Nissan, Mazda]
Array Elements after removing item in index 2:
[Ford, BMW, Nissan, Mazda]
array size: 4
Array Elements:
[]
```

ArrayList: Loop through ArrayList

- Loop through the elements of an ArrayList with a for loop, and use the size() method to specify how many times the loop should run

```
import java.util.ArrayList;
public class ArrayListExample {
    public static void main(String[] args) {
        ArrayList<String> cars=new ArrayList<String>();
        // add Elemnts to the arrayList
        cars.add("Volvo");
        cars.add("BMW");
        cars.add("Toyota");
        cars.add("Nissan");
        cars.add("Mazda");
        System.out.println("Array Elements");
        for(int index=0;index<cars.size();index++)
            System.out.println(cars.get(index));
    }
}
```

Output

```
Array Elements
Volvo
BMW
Toyota
Nissan
Mazda
```

ArrayList: Other Types of ArrayList

- For other primitive types, use: Integer for Integer, Boolean for boolean, Character for char, Double for double, etc:

Example

Create an `ArrayList` to store numbers (add elements of type `Integer`):

```
import java.util.ArrayList;

public class MyClass {
  public static void main(String[] args) {
    ArrayList<Integer> myNumbers = new ArrayList<Integer>();
    myNumbers.add(10);
    myNumbers.add(15);
    myNumbers.add(20);
    myNumbers.add(25);
    for (int i : myNumbers) {
      System.out.println(i);
    }
  }
}
```

output

```
10
15
20
25
```

Sorting Elements in Arrays

1. Traditional Array type (One Dimension & Two Dimension):

- For sorting elements in a built-in array we use class Array in Package Java.util
- We import the Array class:

```
import java.util.Arrays;
```

- Then we use sort() method for sorting

```
Arrays.sort(arrayname);
```

```
run:
6
8
9
12
15
20
```

```
import java.util.Arrays;
public class test {
    public static void main(String[] args) {
     int [] x={12,15,8,9,6,20};
     Arrays.sort(x);
       for (int i :x)
           System.out.println(i);
}

    }
```

Sorting Elements in Arrays

2. *Sorting Elements in ArrayList*

- Another useful class in the java.util package is the Collections class, which include the sort() method for sorting lists alphabetically or numerically
- First we import the **Collection** class

```
import java.util.Collections;  // Import the Collections class
```

- Then in the program we use sort method to sort elements in the arraylist alphabetically.

```
Collections.sort(cars);  // Sort cars
```

Sorting Elements in Arrays

2. *Sorting Elements in ArrayList*

```java
import java.util.ArrayList;
import java.util.Collections;  // Import the Collections class

public class MyClass {
  public static void main(String[] args) {
    ArrayList<String> cars = new ArrayList<String>();
    cars.add("Volvo");
    cars.add("BMW");
    cars.add("Ford");
    cars.add("Mazda");
    Collections.sort(cars);  // Sort cars
    for (String i : cars) {
      System.out.println(i);
    }
  }
}
```

output

```
BMW
Ford
Mazda
Volvo
```