```
Q .24 Create a class to calculate Area of circle with one data member to store
the radius and
another to store area value in java
Create method members
1. init - to input radius from user
2. calc - to calculate area
3. display- to display area

 import java.util.Scanner;

class Circle {
   private double radius;
   private double area;

   // Method to input radius from user
   public void init() {
       Scanner scanner = new Scanner(System.in);
       System.out.print("Enter the radius of the circle: ");
       radius = scanner.nextDouble();
       scanner.close();
   }

   // Method to calculate area
   public void calc() {
       area = Math.PI * Math.pow(radius, 2);
   }

   // Method to display area
   public void display() {
       System.out.println("The area of the circle is: " + area);
   }

   public static void main(String[] args) {
       Circle circle = new Circle();
       circle.init();
       circle.calc();
       circle.display();
   }
}
```

Ans : /Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java -javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49485 -Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath /Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java Workshop Circle
Name :- Vipashyana Wagh
Enter the radius of the circle: 5
The area of the circle is: 78.53981633974483

Q .25 :- Q.25 Write a program in Java to create a class MathOperation with two data member X and Y to store the operand and third data member R to store result of operation.
Create method members
1. init - to input X and Y from user
2. add - to add X and Y and store in R
3. multiply - to multiply X and Y and store in R
4. power - to calculate X and Y and store in R
5. display - to display Result R

```
import java.util.Scanner;
class MathOperation {
   private double X;
   private double Y;
   private double R;

   // Method to input X and Y from user
   public void init() {
       Scanner scanner = new Scanner(System.in);
       System.out.print("Vipashyana Wagh ,0873CS231135\n");
       System.out.print("Enter the value of X: ");
       X = scanner.nextDouble();
       System.out.print("Enter the value of Y: ");
       Y = scanner.nextDouble();
       scanner.close();
   }

   // Method to add X and Y
   public void add() {
       R = X + Y;
   }

   // Method to multiply X and Y
   public void multiply() {
       R = X * Y;
   }

   // Method to calculate X to the power of Y
   public void power() {
       R = Math.pow(X, Y);
   }

   // Method to display result
   public void display(String operation) {
       System.out.println("The result of " + operation + " operation is: " +
R);
   }

   public static void main(String[] args) {
       MathOperation mathOperation = new MathOperation();
       mathOperation.init();
```

```
        mathOperation.add();
        mathOperation.display("addition");
        mathOperation.multiply();
        mathOperation.display("multiplication");
        mathOperation.power();
        mathOperation.display("exponentiation (X^Y)");
    }
}
```

Ans :- /Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java -javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49509 -Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath /Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java Workshop MathOperation
Vipashyana Wagh ,0873CS231135
Enter the value of X: 3
Enter the value of Y: 4
The result of addition operation is: 7.0
The result of multiplication operation is: 12.0
The result of exponentiation (X^Y) operation is: 81.0

```
Q.26 Write a program in Java to create a class MathOperation containing method
'multiply' to
calculate multiplication of following arguments.
       a. two integers
b. three float
c. all elements of array
d. one double and one integer
import java.util.Scanner;
class MathOperation {
   // Method to multiply two integers
   public int multiply(int a, int b) {
       return a * b;
   }

   // Method to multiply three floats
   public float multiply(float a, float b, float c) {
       return a * b * c;
   }

   // Method to multiply all elements of an array
   public int multiply(int[] array) {
       int result = 1;
       for (int i : array) {
           result *= i;
       }
       return result;
   }

   // Method to multiply a double and an integer
   public double multiply(double a, int b) {
       return a * b;
   }

   public static void main(String[] args) {
       MathOperation mathOperation = new MathOperation();
// Multiply two integers
       int result1 = mathOperation.multiply(5, 6);
       System.out.print(" Vipashyana Wagh , 0873CS231135\n ");
       System.out.println("Multiplication of two integers: 5 * 6 = " +
result1);
// Multiply three floats
       float result2 = mathOperation.multiply(2.5f, 3.5f, 4.5f);
       System.out.println("Multiplication of three floats: 2.5 * 3.5 * 4.5 = "
+ result2);
// Multiply all elements of an array
       int[] array = {1, 2, 3, 4, 5};
       int result3 = mathOperation.multiply(array);
```

```
        System.out.println("Multiplication of all elements of the array: " +
result3);
// Multiply a double and an integer
        double result4 = mathOperation.multiply(2.5, 3);
        System.out.println("Multiplication of a double and an integer: 2.5 * 3 =
" + result4);
    }
}
```

Ans :- /Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java -javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49537 -Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath /Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java Workshop MathOperation
Vipashyana Wagh , 0873CS231135
Multiplication of two integers: 5 * 6 = 30
Multiplication of three floats: 2.5 * 3.5 * 4.5 = 39.375
Multiplication of all elements of the array: 120
Multiplication of a double and an integer: 2.5 * 3 = 7.5

```
Q.27 the collection.
        Write a program in Java to create an ArrayList , add some colors (as
strings), and print
import java.util.ArrayList;
public class Main {
    public static void main(String[] args) {
// Create an ArrayList
        ArrayList<String> colors = new ArrayList<>();
// Add colors to the ArrayList
        colors.add("Red");
        colors.add("Green");
        colors.add("Blue");
        colors.add("Yellow");
        colors.add("Orange");
// Print the ArrayList
        System.out.print(" Vipashyana Wagh 0873CS231135");
    }
}
```

Ans :- /Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java -javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49540 -Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath /Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java Workshop Main
Vipashyana Wagh 0873CS231135
Process finished with exit code 0

```
Q.28 Write a program in Java to insert an element into the ArrayList at the
first position .
import java.util.ArrayList;
public class Main {
   public static void main(String[] args) {
// Create an ArrayList
       ArrayList<String> colors = new ArrayList<>();
// Add colors to the ArrayList
       colors.add("Green");
       colors.add("Blue");
       colors.add("Yellow");
       colors.add("Orange");
       System.out.println("Vipashyana Wagh 0873CS231135");
       System.out.println("Original ArrayList: " + colors);
// Insert an element at the first position
       colors.add(0,
               "Red");
       System.out.println("ArrayList after inserting 'Red' at the first
position: " + colors);
   }
}
```

Ans :- /Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java -javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49548 -Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath /Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java Workshop Main
Vipashyana Wagh 0873CS231135
Original ArrayList: [Green, Blue, Yellow, Orange]
ArrayList after inserting 'Red' at the first position: [Red, Green, Blue, Yellow, Orange]

```
Q.29 Write a program in Java to retrieve an element at a specified index from a
given ArrayList.
import java.util.ArrayList;
public class Main {
   public static void main(String[] args) {
// Create an ArrayList
       ArrayList<String> colors = new ArrayList<>();
// Add colors to the ArrayList
       colors.add("Red");
       colors.add("Green");
       colors.add("Blue");
       colors.add("Yellow");
       colors.add("Orange");
       System.out.println("Vipashyana Wagh 0873CS231135");
       System.out.println("ArrayList: " + colors);
// Specify the index
       int index = 2;
// Retrieve the element at the specified index
       String color = colors.get(index);
       System.out.println("Element at index " + index + ": " + color);
   }
}
```

Ans :- /Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java -javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49553 -Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath /Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java Workshop Main
Vipashyana Wagh 0873CS231135
ArrayList: [Red, Green, Blue, Yellow, Orange]
Element at index 2: Blue

```
Q.30 Write a program in Java to update an ArrayList element by a given element
.
import java.util.ArrayList;
public class Main {
   public static void main(String[] args) {
// Create an ArrayList
       ArrayList<String> colors = new ArrayList<>();
// Add colors to the ArrayList
       colors.add("Red");
       colors.add("Green");
       colors.add("Blue");
       colors.add("Yellow");
       colors.add("Orange");
       System.out.println("Vipashyana Wagh 0873CS231135");
       System.out.println("Original ArrayList: " + colors);
// Specify the index and new value
       int index = 2;
       String newValue = "Purple";
// Update the element at the specified index
       colors.set(index, newValue);
       System.out.println("ArrayList after updating: " + colors);
   }
}
```

Ans :- /Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java -javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49557 -Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath /Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java Workshop Main
Vipashyana Wagh 0873CS231135
Original ArrayList: [Red, Green, Blue, Yellow, Orange]
ArrayList after updating: [Red, Green, Purple, Yellow, Orange]

```java
Q.31 Write a program in Java to remove the third element from an ArrayList.
import java.util.ArrayList;
public class Main {
   public static void main(String[] args) {
// Create an ArrayList
       ArrayList<String> colors = new ArrayList<>();
// Add colors to the ArrayList
       colors.add("Red");
       colors.add("Green");
       colors.add("Blue");
       colors.add("Yellow");
       colors.add("Orange");
       System.out.println("Vipashyana 0873CS231135");
       System.out.println("Original ArrayList: " + colors);
// Specify the index
       int index = 2;
// Remove the element at the specified index
       String removedColor = colors.remove(index);
       System.out.println("Removed color: " + removedColor);
       System.out.println("ArrayList after removal: " + colors);
   }
}
```

Ans : - /Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java -javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49585 -Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath /Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java Workshop Main
Vipashyana Wagh 0873CS231135
Original ArrayList: [Red, Green, Blue, Yellow, Orange]
Removed color: Blue
ArrayList after removal: [Red, Green, Yellow, Orange]

```java
.32 Write a program in Java to search for an element in an ArrayList.
import java.util.ArrayList;
public class Main {
   public static void main(String[] args) {
// Create an ArrayList
       ArrayList<String> colors = new ArrayList<>();
// Add colors to the ArrayList
       colors.add("Red");
       colors.add("Green");
       colors.add("Blue");
       colors.add("Yellow");
       colors.add("Orange");
       System.out.println("Vipashyana Wagh 0873CS231135");
       System.out.println("ArrayList: " + colors);
// Specify the element to search for
       String targetColor = "Blue";
// Search for the element
       if (colors.contains(targetColor)) {
           System.out.println(targetColor + " is found in the ArrayList.")
;
                   System.out.println("Index of " + targetColor + ": " +
colors.indexOf(targetColor));
       } else {
           System.out.println(targetColor + " is not found in the ArrayList.");

       }
   }
}
```

/Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java
-javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49590
-Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath
/Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java
Workshop Main
Vipashyana Wagh 0873CS231135
ArrayList: [Red, Green, Blue, Yellow, Orange]
Blue is found in the ArrayList.
Index of Blue: 2

```java
Q.33 Write a Java program to sort a given ArrayList.
import java.util.ArrayList;
import java.util.Collections;
public class Main {
   public static void main(String[] args) {
// Create an ArrayList
       ArrayList<String> colors = new ArrayList<>();
// Add colors to the ArrayList
       colors.add("Red");
       colors.add("Green");
       colors.add("Blue");
       colors.add("Yellow");
       colors.add("Orange");
       System.out.println("Vipashyana Wagh 0873CS231135");
       System.out.println("Original ArrayList: " + colors);
// Sort the ArrayList
       Collections.sort(colors);
       System.out.println("Sorted ArrayList: " + colors);
   }
}
```

Ans :- /Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java -javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49592 -Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath /Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java Workshop Main
Vipashyana Wagh 0873CS231135
Original ArrayList: [Red, Green, Blue, Yellow, Orange]
Sorted ArrayList: [Blue, Green, Orange, Red, Yellow

Q.34 Write a Java program to copy one array list into another.

```java
import java.util.ArrayList;
public class Main {
   public static void main(String[] args) {
// Create the first ArrayList
       ArrayList<String> colors1 = new ArrayList<>();
// Add colors to the first ArrayList
       colors1.add("Red");
       colors1.add("Green");
       colors1.add("Blue");
       colors1.add("Yellow");
       colors1.add("Orange");
       System.out.println(" Vipashyana Wagh  0873CS231135");
       System.out.println("Original ArrayList: " + colors1);
// Create the second ArrayList
       ArrayList<String> colors2 = new ArrayList<>();
// Copy the first ArrayList into the second ArrayList
       colors2.addAll(colors1);
       System.out.println("Copied ArrayList: " + colors2);
   }
}
```

ANS:- /Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java -javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49604 -Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath /Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java Workshop Main
 Vipashyana Wagh 0873CS231135
Original ArrayList: [Red, Green, Blue, Yellow, Orange]
Copied ArrayList: [Red, Green, Blue, Yellow, Orange]

```java
Q.35 Write a Java program to shuffle elements in an array list.
import java.util.ArrayList;
import java.util.Collections;
public class Main {
   public static void main(String[] args) {
// Create an ArrayList
       ArrayList<String> colors = new ArrayList<>();
// Add colors to the ArrayList
       colors.add("Red");
       colors.add("Green");
       colors.add("Blue");
       colors.add("Yellow");
       colors.add("Orange");
       System.out.println("Vipashyana Wagh  0873CS231135");
       System.out.println("Original ArrayList: " + colors);
// Shuffle the ArrayList
       Collections.shuffle(colors);
       System.out.println("Shuffled ArrayList: " + colors);
   }
}
```

Ans :- /Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java -javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49613 -Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath /Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java Workshop Main
Vipashyana Wagh 0873CS231135
Original ArrayList: [Red, Green, Blue, Yellow, Orange]
Shuffled ArrayList: [Green, Blue, Yellow, Orange, Red]

Process finished with exit code 0

```java
Q.36 Write a Java program to reverse elements in an array list.
import java.util.ArrayList;
import java.util.Collections;
public class Main {
   public static void main(String[] args) {
// Create an ArrayList
       ArrayList<String> colors = new ArrayList<>();
// Add colors to the ArrayList
       colors.add("Red");
       colors.add("Green");
       colors.add("Blue");
       colors.add("Yellow");
       colors.add("Orange");
       System.out.println("Vipashyana Wagh 0873CS231135");
       System.out.println("Original ArrayList: " + colors);
// Reverse the ArrayList
       Collections.reverse(colors);
       System.out.println("Reversed ArrayList: " + colors);
   }
}
```

Ans :- Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java -javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49619 -Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath /Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java Workshop Main
Vipashyana Wagh 0873CS231135
Original ArrayList: [Red, Green, Blue, Yellow, Orange]
Reversed ArrayList: [Orange, Yellow, Blue, Green, Red]

```
Q.37 Write a Java program to extract a portion of an array list .
import java.util.ArrayList;
import java.util.List;
public class Main {
   public static void main(String[] args) {
// Create an ArrayList
       ArrayList<String> colors = new ArrayList<>();
// Add colors to the ArrayList
       colors.add("Red");
       colors.add("Green");
       colors.add("Blue");
       colors.add("Yellow");
       colors.add("Orange");
       System.out.println("Vipashyana Wagh 0873CS231135");
       System.out.println("Original ArrayList: " + colors);
// Extract a portion of the ArrayList
       int start = 1;
       int end = 4;
       List<String> portion = colors.subList(start, end);
       System.out.println("Extracted portion: " + portion);
   }
}
```

Ans:- /Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java -javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49621 -Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath /Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java Workshop Main
Vipashyana Wagh 0873CS231135
Original ArrayList: [Red, Green, Blue, Yellow, Orange]
Extracted portion: [Green, Blue, Yellow]

```
Q.38 Write a Java program to compare two array lists .
import java.util.ArrayList;
public class Main {
   public static void main(String[] args) {
// Create the first ArrayList
       ArrayList<String> colors1 = new ArrayList<>();
       colors1.add("Red");
       colors1.add("Green");
       colors1.add("Blue");
// Create the second ArrayList
       ArrayList<String> colors2 = new ArrayList<>();
       colors2.add("Red");
       colors2.add("Green");
       colors2.add("Blue");
// Create the third ArrayList
       ArrayList<String> colors3 = new ArrayList<>();
       colors3.add("Red");
       colors3.add("Green");
       colors3.add("Yellow");
       System.out.println(" Vipashyana Wagh 0873CS231135");
       System.out.println("ArrayList 1: " + colors1);
       System.out.println("ArrayList 2: " + colors2);
       System.out.println("ArrayList 3: " + colors3);
// Compare ArrayList 1 and ArrayList 2
       if (colors1.equals(colors2)) {
           System.out.println("ArrayList 1 and ArrayList 2 are equal.");

       } else {
           System.out.println("ArrayList 1 and ArrayList 2 are not equal.");

       }
// Compare ArrayList 1 and ArrayList 3
       if (colors1.equals(colors3)) {
           System.out.println("ArrayList 1 and ArrayList 3 are equal.");

       } else {
           System.out.println("ArrayList 1 and ArrayList 3 are not equal.");
       }
   }
}
```

Ans :- /Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java -javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49633 -Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath /Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java Workshop Main
 Vipashyana Wagh 0873CS231135
ArrayList 1: [Red, Green, Blue]

ArrayList 2: [Red, Green, Blue]
ArrayList 3: [Red, Green, Yellow]
ArrayList 1 and ArrayList 2 are equal.
ArrayList 1 and ArrayList 3 are not equal.

```
Q.39 Write a Java program that swaps two elements in an array list.
import java.util.ArrayList;
import java.util.Collections;
public class Main {
   public static void main(String[] args) {
// Create an ArrayList
       ArrayList<String> colors = new ArrayList<>();
// Add colors to the ArrayList
       colors.add("Red");
       colors.add("Green");
       colors.add("Blue");
       colors.add("Yellow");
       colors.add("Orange");
       System.out.println("Vipashyana Wagh 0873CS231135");
       System.out.println("Original ArrayList: " + colors);
// Specify the indices of the elements to swap
       int index1 = 1;
       int index2 = 3;
// Swap the elements
       Collections.swap(colors, index1, index2);
       System.out.println("ArrayList after swapping: " + colors);
   }
}
```

Ans:- /Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java -javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49637 -Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath /Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java Workshop Main
Vipashyana Wagh 0873CS231135
Original ArrayList: [Red, Green, Blue, Yellow, Orange]
ArrayList after swapping: [Red, Yellow, Blue, Green, Orange]

Q.40 Write a program in Java to iterate through all elements in an ArrayList.

```
Q.40Write a program in Java to iterate through all elements in an ArrayList.

import java.util.ArrayList;
public class Main {
   public static void main(String[] args) {
// Create an ArrayList
       ArrayList<String> colors = new ArrayList<>();
// Add colors to the ArrayList
       colors.add("Red");
       colors.add("Green");
       colors.add("Blue");
       colors.add("Yellow");
       colors.add("Orange");
// Iterate through the ArrayList using for-each loop
       System.out.println("Vipashyana Wagh 0873CS231135");
       System.out.println("Using for-each loop:");
       for (String color : colors) {
           System.out.println(color);
       }
// Iterate through the ArrayList using traditional for loop
       System.out.println("\nUsing traditional for loop:");
       for (int i = 0; i < colors.size(); i++) {
           System.out.println(colors.get(i));
       }
// Iterate through the ArrayList using Java 8 forEach method
       System.out.println("\nUsing Java 8 forEach method:");
       colors.forEach(color -> System.out.println(color));
// Iterate through the ArrayList using Java 8 forEach method with method
reference
       System.out.println("\nUsing Java 8 forEach method with method
reference:");
       colors.forEach(System.out::println);
   }
}
```

```
/Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java
-javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49649
-Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath
/Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java
Workshop Main
Vipashyana Wagh 0873CS231135
Using for-each loop:
Red
Green
Blue
Yellow
Orange
```

Using traditional for loop:
Red
Green
Blue
Yellow
Orange

Using Java 8 forEach method:
Red
Green
Blue
Yellow
Orange

Using Java 8 forEach method with method reference:
Red
Green
Blue
Yellow
Orange

```java
Q.41 Write a Java program to join two array lists.
import java.util.ArrayList;
public class Main {
   public static void main(String[] args) {
// Create the first ArrayList
       ArrayList<String> colors1 = new ArrayList<>();
       colors1.add("Red");
       colors1.add("Green");
       colors1.add("Blue");
// Create the second ArrayList
       ArrayList<String> colors2 = new ArrayList<>();
       colors2.add("Yellow");
       colors2.add("Orange");
       colors2.add("Purple");
       System.out.println("Vipashyana Wagh 0873CS231135");
       System.out.println("ArrayList 1: " + colors1);
       System.out.println("ArrayList 2: " + colors2);
// Join the two ArrayLists
       colors1.addAll(colors2);
       System.out.println("Joined ArrayList: " + colors1);
   }
}
```

```
/Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java
-javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49660
-Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath
/Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java
Workshop Main
Vipashyana Wagh 0873CS231135
ArrayList 1: [Red, Green, Blue]
ArrayList 2: [Yellow, Orange, Purple]
Joined ArrayList: [Red, Green, Blue, Y
```

```java
Q.42 Write a Java program to clone an array list to another array list.
import java.util.ArrayList;
public class Main {
   public static void main(String[] args) {
// Create the original ArrayList
       ArrayList<String> colors = new ArrayList<>();
       colors.add("Red");
       colors.add("Green");
       colors.add("Blue");
       System.out.println("Vipashyana Wagh  0873CS231135");
       System.out.println("Original ArrayList: " + colors);
// Clone the ArrayList
       ArrayList<String> clonedColors = new ArrayList<>(colors);
       System.out.println("Cloned ArrayList: " + clonedColors);
// Modify the cloned ArrayList
       clonedColors.add("Yellow");
       System.out.println("Original ArrayList after modification: " + colors);
       System.out.println("Cloned ArrayList after modification: " +
clonedColors);
   }
}
```

```
/Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java
-javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49663
-Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath
/Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java
Workshop Main
Vipashyana Wagh  0873CS231135
Original ArrayList: [Red, Green, Blue]
Cloned ArrayList: [Red, Green, Blue]
Original ArrayList after modification: [Red, Green, Blue]
Cloned ArrayList after modification: [Red, Green, Blue, Yellow]
```

Q.43 Write a Java program to empty an array list.

```java
import java.util.ArrayList;
public class Main {
   public static void main(String[] args) {
// Create an ArrayList
       ArrayList<String> colors = new ArrayList<>();
       colors.add("Red");
       colors.add("Green");
       colors.add("Blue");
       System.out.println("Vipashyana Wagh  0873CS231135");
       System.out.println("Original ArrayList: " + colors);
// Empty the ArrayList
       colors.clear();
       System.out.println("ArrayList after clearing: " + colors);
   }
}
```

```
/Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java
-javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49666
-Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath
/Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java
Workshop Main
Vipashyana Wagh  0873CS231135
Original ArrayList: [Red, Green, Blue]
ArrayList after clearing: []
```

Q.44 Write a Java program to test whether an array list is empty or not.

```java
import java.util.ArrayList;
public class Main {
   public static void main(String[] args) {
// Create an empty ArrayList
       ArrayList<String> colors = new ArrayList<>();
// Test if the ArrayList is empty
       if (colors.isEmpty()) {
           System.out.println(" Vipashyana Wagh 0873CS231135");
           System.out.println("The ArrayList is empty.");

       } else {
           System.out.println("The ArrayList is not empty.");

       }
// Add elements to the ArrayList
       colors.add("Red");
       colors.add("Green");
       colors.add("Blue");
// Test if the ArrayList is empty
       if (colors.isEmpty()) {
           System.out.println("The ArrayList is empty.");

       } else {
           System.out.println("The ArrayList is not empty. It contains " +
colors.size() + "elements.");
       }
   }
}
```

```
/Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java
-javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49668
-Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath
/Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java
Workshop Main
 Vipashyana Wagh 0873CS231135
The ArrayList is empty.
The ArrayList is not empty. It contains 3elements.
```

```
Q.45 Write a Java program for trimming the capacity of an array list.
```

```java
import java.util.ArrayList;
public class Main {
   public static void main(String[] args) {
// Create an ArrayList
       ArrayList<String> colors = new ArrayList<>();
// Add elements to the ArrayList
       colors.add("Red");
       colors.add("Green");
       colors.add("Blue");
       System.out.println("Vipashyana Wagh 0873CS231135");
       System.out.println("Initial ArrayList: " + colors);
       System.out.println("Initial capacity: " + colors.size());
// Add more elements to increase the capacity
       for (int i = 0; i < 10; i++) {
           colors.add("Color " + i);
       }
       System.out.println("ArrayList after adding more elements: " + colors);
       System.out.println("Capacity after adding more elements: " +
colors.size());
// Trim the capacity of the ArrayList
       colors.trimToSize();
       System.out.println("ArrayList after trimming capacity: " + colors);
       System.out.println("Capacity after trimming: " + colors.size());
   }
}
```

Ans:- Vipashyana Wagh 0873CS231135
Initial ArrayList: [Red, Green, Blue]
Initial capacity: 3
ArrayList after adding more elements: [Red, Green, Blue, Color 0, Color 1, Color 2, Color 3, Color 4, Color 5, Color 6, Color 7, Color 8, Color 9]
Capacity after adding more elements: 13
ArrayList after trimming capacity: [Red, Green, Blue, Color 0, Color 1, Color 2, Color 3, Color 4, Color 5, Color 6, Color 7, Color 8, Color 9]
Capacity after trimming: 13

Q.46 Write a Java program to increase an array list size.

```java
import java.util.ArrayList;
public class Main {
   public static void main(String[] args) {
// Create an ArrayList
       ArrayList<String> colors = new ArrayList<>(5); // Initial capacity is 5
       System.out.println("Vipashyana Wagh 0873CS231114");
       System.out.println("Initial capacity: " + getCapacity(colors));
// Add elements to the ArrayList
       colors.add("Red");
       colors.add("Green");
       colors.add("Blue");
       colors.add("Yellow");
       colors.add("Orange");
       System.out.println("ArrayList size after adding 5 elements: " +
colors.size());
// Add more elements to increase the size
       colors.add("Purple");
       colors.add("Pink");
       System.out.println("ArrayList size after adding 2 more elements: " +
colors.size());
   }

   // Helper method to estimate the capacity (Note: actual capacity may vary)
   private static int getCapacity(ArrayList<?> list) {
       try {
           java.lang.reflect.Field field =
ArrayList.class.getDeclaredField("elementData");
           field.setAccessible(true);
           Object[] array = (Object[]) field.get(list);
           return array.length;
       } catch (Exception e) {
           return -1; // Unable to estimate capacity
       }
   }
}
```

```
/Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java
-javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49680
-Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath
/Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java
Workshop Main
Vipashyana Wagh 0873CS231114
Initial capacity: -1
ArrayList size after adding 5 elements: 5
ArrayList size after adding 2 more elements: 7
```

```java
Q.47 Write a Java program to replace the second element of an ArrayList with
the specified
       element.
import java.util.ArrayList;
public class Main {
   public static void main(String[] args) {
// Create an ArrayList
       ArrayList<String> colors = new ArrayList<>();
// Add elements to the ArrayList
       colors.add("Red");
       colors.add("Green");
       colors.add("Blue");
       colors.add("Yellow");
       colors.add("Orange");
       System.out.println("Vipashyana Wagh 0873CS231135");
       System.out.println("Original ArrayList: " + colors);
// Replace the second element with a specified element
       String newElement = "Purple";
       colors.set(1, newElement);
       System.out.println("ArrayList after replacing the second element: " +
colors);
   }
```

/Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java
-javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49688
-Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath
/Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java
Workshop Main
Vipashyana Wagh 0873CS231135
Original ArrayList: [Red, Green, Blue, Yellow, Orange]
ArrayList after replacing the second element: [Red, Purple, Blue, Yellow, Orange]

```
.48 Write a Java program to print all the elements of an ArrayList using the
elements position.
import java.util.ArrayList;
public class Main {
   public static void main(String[] args) {
// Create an ArrayList
       ArrayList<String> colors = new ArrayList<>();
// Add elements to the ArrayList
       colors.add("Red");
       colors.add("Green");
       colors.add("Blue");
       colors.add("Yellow");
       colors.add("Orange");
       System.out.println("Vipashyana Wagh 0873CS231135");
       System.out.println("ArrayList elements using position:");
       for (int i = 0; i < colors.size(); i++) {
           System.out.println("Element at position " + (i + 1) + ": " +
colors.get(i));
       }
   }
}
```

```
/Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java
-javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49695
-Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath
/Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java
Workshop Main
Vipashyana Wagh 0873CS231135
ArrayList elements using position:
Element at position 1: Red
Element at position 2: Green
Element at position 3: Blue
Element at position 4: Yellow
Element at position 5: Orange
```

Q.49 Write a Java program to append a specified element to the end of a linked list.

```
import java.util.LinkedList;
public class Main {
   public static void main(String[] args) {
// Create a LinkedList
       LinkedList<String> colors = new LinkedList<>();
// Add elements to the LinkedList
       colors.add("Red");
       colors.add("Green");
       colors.add("Blue");
       System.out.println("Vipashyana Wagh 0873CS231135");
       System.out.println("Original LinkedList: " + colors);
// Append a specified element to the end of the LinkedList
       String newElement = "Yellow";
       colors.addLast(newElement);
       System.out.println("LinkedList after appending the element: " + colors);
   }
}
```

```
/Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java
-javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49697
-Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath
/Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java
Workshop Main
Vipashyana Wagh 0873CS231135
Original LinkedList: [Red, Green, Blue]
LinkedList after appending the element: [Red, Green, Blue, Yellow]

Process finished with exit code 0
```

Q.50 Write a Java program to iterate through all elements in a linked list.

```java
import java.util.LinkedList;
import java.util.Iterator;
public class Main {
   public static void main(String[] args) {
// Create a LinkedList
       LinkedList<String> colors = new LinkedList<>();
// Add elements to the LinkedList
       colors.add("Red");
       colors.add("Green");
       colors.add("Blue");
       colors.add("Yellow");
       colors.add("Orange");
// Iterate through all elements using Iterator
       System.out.println("Vipashyana Wagh 0873CS231135");
       System.out.println("Iterating using Iterator:");
       Iterator<String> iterator = colors.iterator();
       while (iterator.hasNext()) {
           System.out.println(iterator.next());
       }
// Iterate through all elements using for-each loop
       System.out.println("\nIterating using for-each loop:");
       for (String color : colors) {
           System.out.println(color);
       }
// Iterate through all elements using traditional for loop
       System.out.println("\nIterating using traditional for loop:");
       for (int i = 0; i < colors.size(); i++) {
           System.out.println(colors.get(i));
       }
   }
}
```

```
Vipashyana Wagh 0873CS231135
Iterating using Iterator:
Red
Green
Blue
Yellow
Orange

Iterating using for-each loop:
Red
Green
Blue
Yellow
Orange

Iterating using traditional for loop:
Red
Green
Blue
Yellow
Orange
```

```
Q.51 Write a Java program to iterate through all elements starting from a
specified position in a linked
       list.
import java.util.LinkedList;
import java.util.ListIterator;
public class Main {
   public static void main(String[] args) {
// Create a LinkedList
       LinkedList<String> colors = new LinkedList<>();
// Add elements to the LinkedList
       colors.add("Red");
       colors.add("Green");
       colors.add("Blue");
       colors.add("Yellow");
       colors.add("Orange");
// Specify the starting position
       int startPosition = 2;
// Iterate through all elements starting from the specified position
       System.out.println("Vipashyana Wagh 0873CS231135");
       System.out.println("Iterating from position " + startPosition + ":");
       ListIterator<String> iterator = colors.listIterator(startPosition);
       while (iterator.hasNext()) {
           System.out.println(iterator.next());
       }
   }
}
```

/Library/Java/JavaVirtualMachines/jdk-24.jdk/Contents/Home/bin/java
-javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=49714
-Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath
/Users/vipashyanawagh/IdeaProjects/Java Workshop/Java Workshop/out/production/Java
Workshop Main
Vipashyana Wagh 0873CS231135
Iterating from position 2:
Blue
Yellow
Orange