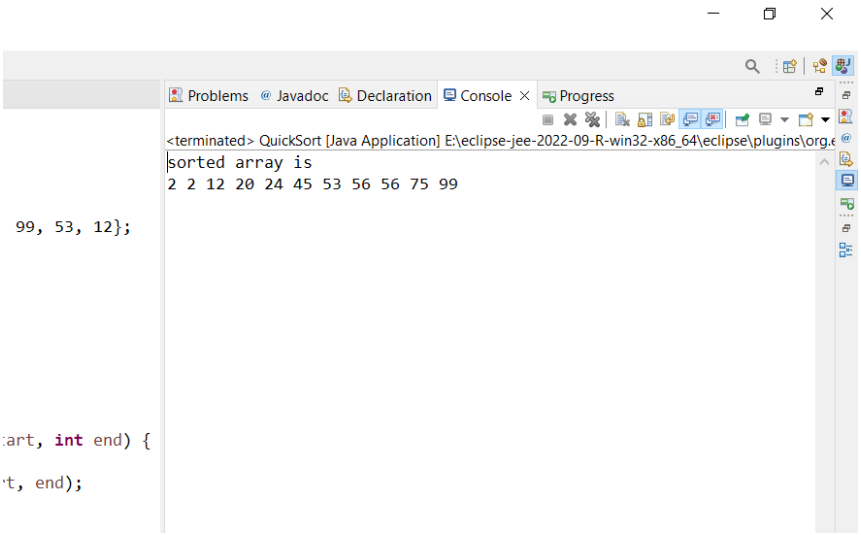
1. Write a Java program to
a. Perform quick sort

```java
package com.main;

public class QuickSort {

	public static void main(String[] args) {
	    int[] input = {24, 2, 45, 20, 56, 75, 2, 56, 99, 53, 12};
	    System.out.println("sorted array is");
	    quickSort(input, 0, input.length-1);
	    for(int i: input){

	        System.out.print(i);
	        System.out.print(" ");
	    }
}

	public static void quickSort(int[] input, int start, int end) {
	    if (start < end) {
	      int partitionIndex = partition(input, start, end);
	      quickSort(input, start, partitionIndex-1);
	      quickSort(input, partitionIndex+1, end);
	    }
	  }

	  public static int partition(int[] input, int start, int end) {
	    int pivot = input[end];
	    int i = start-1;
	    for (int j = start; j < end; j++) {
	      if (input[j] <= pivot) {
	        i++;
	        int temp = input[i];
	        input[i] = input[j];
	        input[j] = temp;
	      }
	    }
	    int temp = input[i+1];
	    input[i+1] = input[end];
	    input[end] = temp;
	    return i+1;
	  }
	}
```

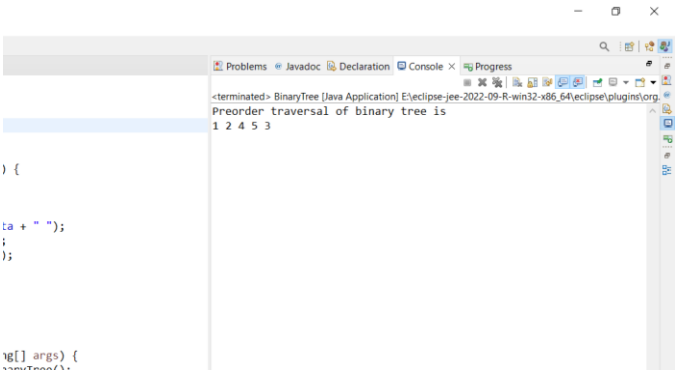
OUTPUT:


Problems
Javadoc
Declaration
Console
Progress
<terminated> QuickSort [Java Application] E:\eclipse-jee-2022-09-R-win32-x86_64\eclipse\plugins\org.
sorted array is
2 2 12 20 24 45 53 56 56 75 99
99, 53, 12};
art, int end) {
t, end);

b. Perform preorder tree traversal

```java
package com.tree;

public class BinaryTree {

	Node root;

	   void printPreorder(Node node) {
	       if (node == null) {
	           return;
	       }
	       System.out.print(node.data + " ");
	       printPreorder(node.left);
	       printPreorder(node.right);
	   }

	   void printPreorder()  {
	       printPreorder(root);
	   }

	   public static void main(String[] args) {
	       BinaryTree tree = new BinaryTree();
	       tree.root = new Node(1);
	       tree.root.left = new Node(2);
	       tree.root.right = new Node(3);
	       tree.root.left.left = new Node(4);
	       tree.root.left.right = new Node(5);
	       System.out.println("Preorder traversal of binary tree is ");
	       tree.printPreorder();
	   }

}
class Node {
    int data;
    Node left, right;

    Node(int item) {
        data = item;
        left = right = null;
    }
}
```

OUTPUT:


Problems
Javadoc
Declaration
Console
Progress
<terminated> BinaryTree [Java Application] E:\eclipse-jee-2022-09-R-win32-x86_64\eclipse\plugins\org.
Preorder traversal of binary tree is
1 2 4 5 3