Practical No. 1: Write a program to insert a string into another string (Without using any predefined method) at any given index.

Source Code:

```
import java.util.Scanner;

class StringAppend

{

   String insertString(String str , int index , String append)

   {

      char[] newStr = new char[str.length() + append.length()];

      int i = 0;

      for(i = 0 ; i < index ; i++)

      {

         newStr[i] = str.charAt(i);

      }

      for(int j = 0 ; j < append.length(); i++,j++)

      {

         newStr[i] = append.charAt(j);

      }

      for(int k = index ; k < str.length() ; i++,k++)

      {

         newStr[i] = str.charAt(k);

      }

      return new String(newStr);

   }

}

public class Q1 {


   public static void main(String args[])

   {
```


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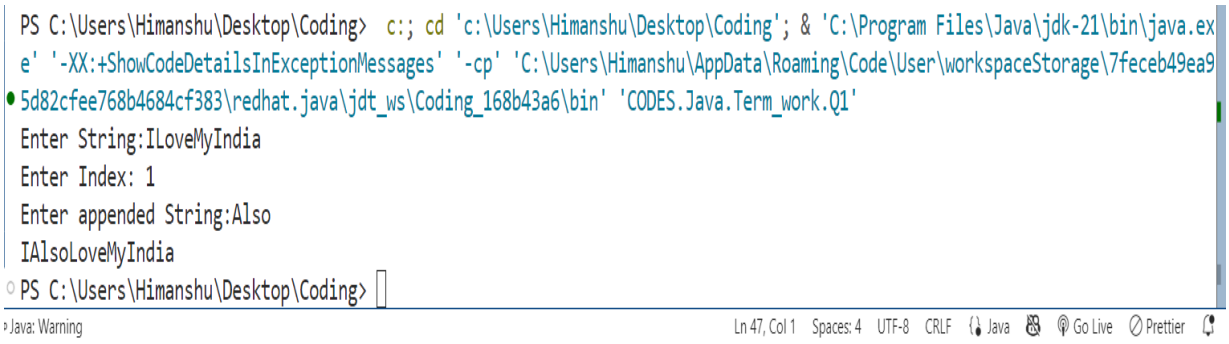
```
        StringAppend obj = new StringAppend();
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter String:");
        String str = sc.nextLine();
        System.out.print("Enter Index: ");
        int ind = sc.nextInt();
        System.out.print("Enter appended String:");
        String appendStr = sc.next();
        String newStr = obj.insertString(str, ind, appendStr);
        System.out.println(newStr);
        sc.close();
    }
}
```

Output:



Name: Himanshu Raturi **Roll No: 32** **Sec: A2**

Practical No. 2: Write a program to check two strings are Anagram of each other.

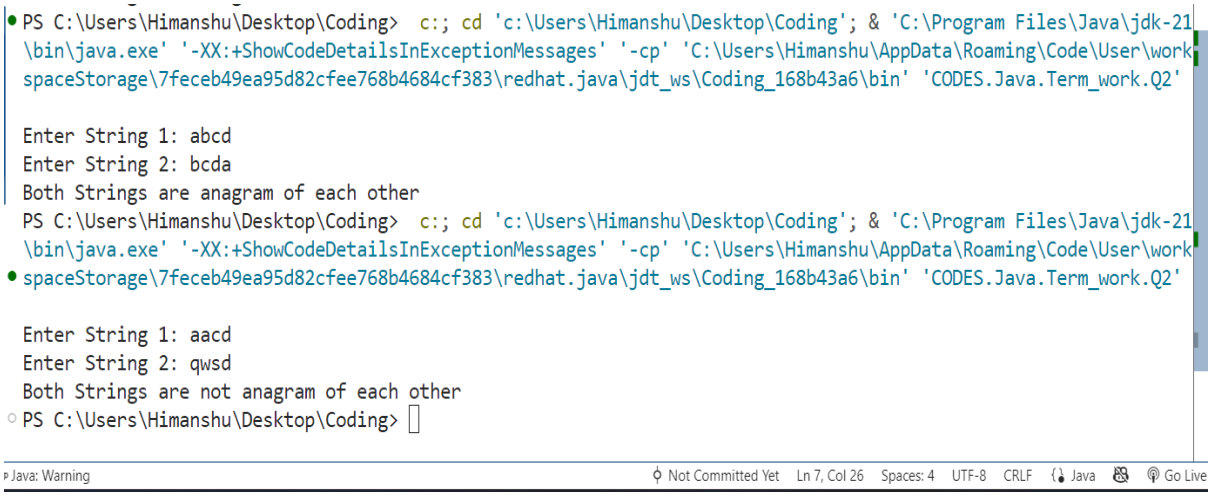
Source Code:

```
import java.util.Arrays;
import java.util.Scanner;
class Anagram
{
   void sortString(char arr[])
   {
      int n = arr.length;
      for(int i = 0 ; i < n ; i++)
      {
         for(int j = 0 ; j < n-i-1 ; j++)
         {
            if(arr[j] > arr[j+1])
            {
               char temp = arr[j];
               arr[j] = arr[j+1];
               arr[j+1] = temp;
            }
         }
      }
   }
   boolean checkAnagram(String str1 , String str2)
   {
      if(str1.length() != str2.length())
      {
         return false;
      }
      char[] arr1 = str1.toCharArray();
```

```
        char[] arr2 = str2.toCharArray();
        sortString(arr1);
        sortString(arr2);
        return Arrays.equals(arr1,arr2);

    }
}
public class Q2 {
    public static void main(String args[])
    {
        Anagram obj = new Anagram();
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter String 1: ");
        String s1 = sc.nextLine();
        System.out.print("Enter String 2: ");
        String s2 = sc.next();
        if(obj.checkAnagram(s1 , s2))
        {
            System.out.println("Both Strings are anagram of each other");
        }else
        {
            System.out.println("Both Strings are not anagram of each other");
        }
        sc.close();
    }

}
```


Name: Himanshu Raturi **Roll No: 32** **Sec: A2**

Output:


PS C:\Users\Himanshu\Desktop\Coding> c:; cd 'c:\Users\Himanshu\Desktop\Coding'; & 'C:\Program Files\Java\jdk-21\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\Himanshu\AppData\Roaming\Code\User\workspaceStorage\7feceb49ea95d82cfee768b4684cf383\redhat.java\jdt_ws\Coding_168b43a6\bin' 'CODES.Java.Term_work.Q2'
Enter String 1: abcd
Enter String 2: bcda
Both Strings are anagram of each other
PS C:\Users\Himanshu\Desktop\Coding> c:; cd 'c:\Users\Himanshu\Desktop\Coding'; & 'C:\Program Files\Java\jdk-21\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\Himanshu\AppData\Roaming\Code\User\workspaceStorage\7feceb49ea95d82cfee768b4684cf383\redhat.java\jdt_ws\Coding_168b43a6\bin' 'CODES.Java.Term_work.Q2'
Enter String 1: aacd
Enter String 2: qwsd
Both Strings are not anagram of each other
PS C:\Users\Himanshu\Desktop\Coding>
Java: Warning
Not Committed Yet
Ln 7, Col 26
Spaces: 4
UTF-8
CRLF
Java
Go Live

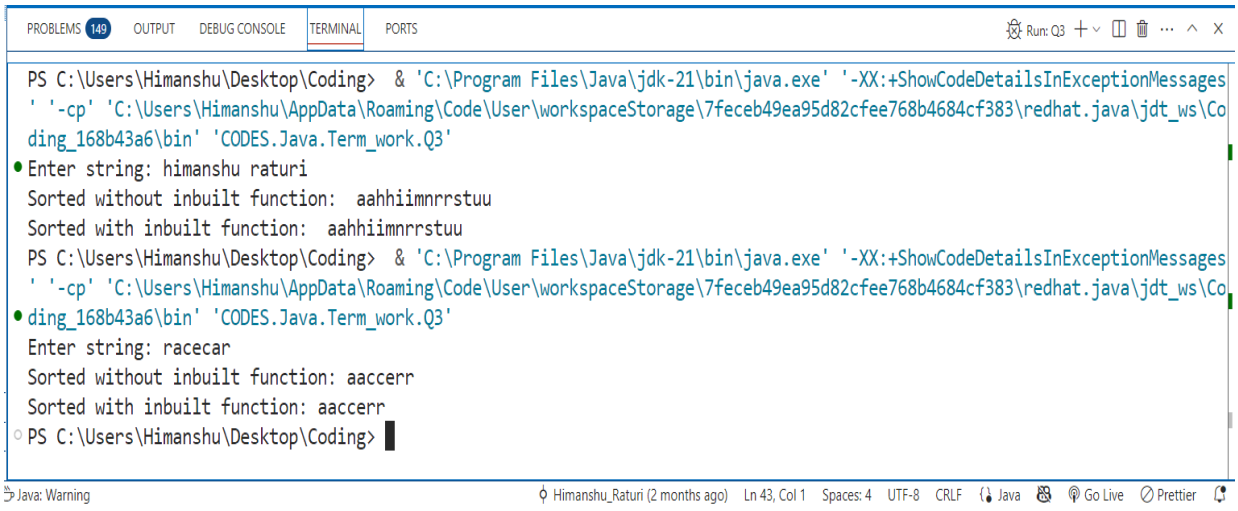
Practical No. 3: Java program for Sorting a String:
(i)Without using any inbuilt sorting functions
(ii) By using inbuilt function

Source Code:

```
import java.util.Arrays;

import java.util.Scanner;

class StringSorting

{

   void sortingWithoutInbuiltFunction(char str[])

   {

      int n = str.length;

      for(int i = 0 ; i < n-1 ; i++)

      {

         for(int j = 0 ; j < n-i-1 ; j++)

         {

            if(str[j] > str[j+1])

            {

               char temp = str[j];

               str[j] = str[j+1];

               str[j+1] = temp;

            }

         }

      }

   }

   void sortingWithInbuiltFunction(char str[])

   {

      Arrays.sort(str);

   }

}

public class Q3 {
```

```
    public static void main(String[] args)
    {
        StringSorting obj = new StringSorting();
        System.out.print("Enter string: ");
        Scanner sc = new Scanner(System.in);
        String input = sc.nextLine();
        char[] str1 = input.toCharArray();
        char[] str2 = input.toCharArray();

        // Sorting without inbuilt function
        obj.sortingWithoutInbuiltFunction(str1);
        System.out.println("Sorted without inbuilt function: " + new String(str1));

        // Sorting with inbuilt function
        obj.sortingWithInbuiltFunction(str2);
        System.out.println("Sorted with inbuilt function: " + new String(str2));
        sc.close();
    }
}
```

Output:


PROBLEMS 149
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
Run: Q3
PS C:\Users\Himanshu\Desktop\Coding> & 'C:\Program Files\Java\jdk-21\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\Himanshu\AppData\Roaming\Code\User\workspaceStorage\7feceb49ea95d82cfee768b4684cf383\redhat.java\jdt_ws\Coding_168b43a6\bin' 'CODES.Java.Term_work.Q3'
Enter string: himanshu raturi
Sorted without inbuilt function: aahhiimnrrstuu
Sorted with inbuilt function: aahhiimnrrstuu
PS C:\Users\Himanshu\Desktop\Coding> & 'C:\Program Files\Java\jdk-21\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\Himanshu\AppData\Roaming\Code\User\workspaceStorage\7feceb49ea95d82cfee768b4684cf383\redhat.java\jdt_ws\Coding_168b43a6\bin' 'CODES.Java.Term_work.Q3'
Enter string: racecar
Sorted without inbuilt function: aaccerr
Sorted with inbuilt function: aaccerr
PS C:\Users\Himanshu\Desktop\Coding>
Java: Warning
Himanshu_Raturi (2 months ago)
Ln 43, Col 1
Spaces: 4
UTF-8
CRLF
Java
Go Live
Prettier

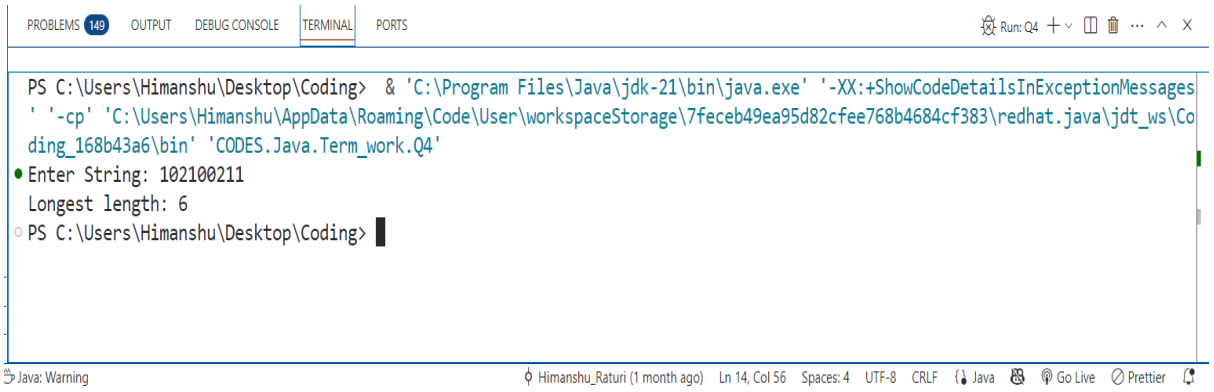
Practical No. 4: Program to Extract Substring from a String with Equal 0, 1, and 2.

Source Code:

```
import java.util.Scanner;
public class Q4 {
    public static int longestEqual012Substring(String str) {
        int maxLength = 0;
        int n = str.length();
        for (int i = 0; i < n; i++) {
            int count0 = 0, count1 = 0, count2 = 0;

            for (int j = i; j < n; j++) {
                char ch = str.charAt(j);

                if (ch == '0') count0++;
                else if (ch == '1') count1++;
                else if (ch == '2') count2++;

                if (count0 == count1 && count1 == count2) {
                    maxLength = Math.max(maxLength, j - i + 1);
                }
            }
        }

        return maxLength;
    }

    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter String: ");
```

```
        String str = sc.nextLine();
        System.out.println("Longest length: " + longestEqual012Substring(str));
        sc.close();
    }


}
```

Output:


PROBLEMS 149
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
Run: Q4
PS C:\Users\Himanshu\Desktop\Coding> & 'C:\Program Files\Java\jdk-21\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\Himanshu\AppData\Roaming\Code\User\workspaceStorage\7feceb49ea95d82cfee768b4684cf383\redhat.java\jdt_ws\Coding_168b43a6\bin' 'CODES.Java.Term_work.Q4'
Enter String: 102100211
Longest length: 6
PS C:\Users\Himanshu\Desktop\Coding>
Java: Warning
Himanshu_Raturi (1 month ago)
Ln 14, Col 56
Spaces: 4
UTF-8
CRLF
Java
Go Live
Prettier

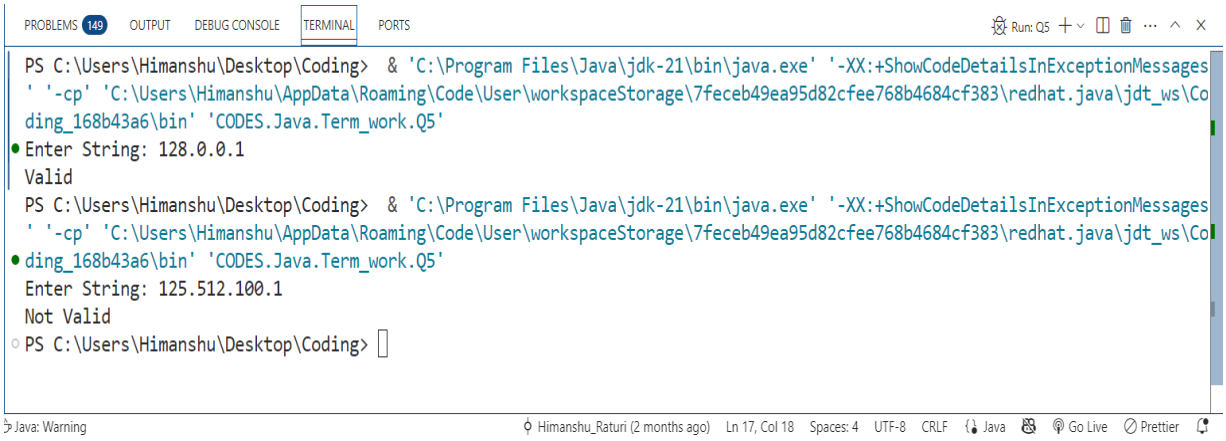
Practical No. 5: Write a program to validate an IPv4 Address.IPv4 addresses are canonically represented in dot-decimal notation, which consists of four decimal numbers, each ranging from 0 to 255, separated by dots, e.g., 172.16.254.1

Source Code:

```
import java.util.Scanner;

public class Q5 {

   public static boolean isValidIPv4(String ip) {

      String[] parts = ip.split("\\.");

      if (parts.length != 4) {

         return false;

      }

      for (String part : parts)

      {

         int num = Integer.parseInt(part);

         if (num < 0 || num > 255) {

            return false;

         }

         if (!part.equals(String.valueOf(num)))

         {

            return false;

         }


      }

      return true;

   }


   public static void main(String[] args) {

      System.out.print("Enter String: ");

      Scanner sc = new Scanner(System.in);

      String ip = sc.nextLine();
```

```
        if (isValidIPv4(ip)) {
            System.out.println("Valid");
        } else {
            System.out.println("Not Valid");
        }
        sc.close();

    }
}
```

Output:


PROBLEMS 149
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
Run: Q5
PS C:\Users\Himanshu\Desktop\Coding> & 'C:\Program Files\Java\jdk-21\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\Himanshu\AppData\Roaming\Code\User\workspaceStorage\7feceb49ea95d82cfee768b4684cf383\redhat.java\jdt_ws\Coding_168b43a6\bin' 'CODES.Java.Term_work.Q5'
Enter String: 128.0.0.1
Valid
PS C:\Users\Himanshu\Desktop\Coding> & 'C:\Program Files\Java\jdk-21\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\Himanshu\AppData\Roaming\Code\User\workspaceStorage\7feceb49ea95d82cfee768b4684cf383\redhat.java\jdt_ws\Coding_168b43a6\bin' 'CODES.Java.Term_work.Q5'
Enter String: 125.512.100.1
Not Valid
PS C:\Users\Himanshu\Desktop\Coding>
Java: Warning
Himanshu_Raturi (2 months ago)
Ln 17, Col 18
Spaces: 4
UTF-8
CRLF
Java
Go Live
Prettier

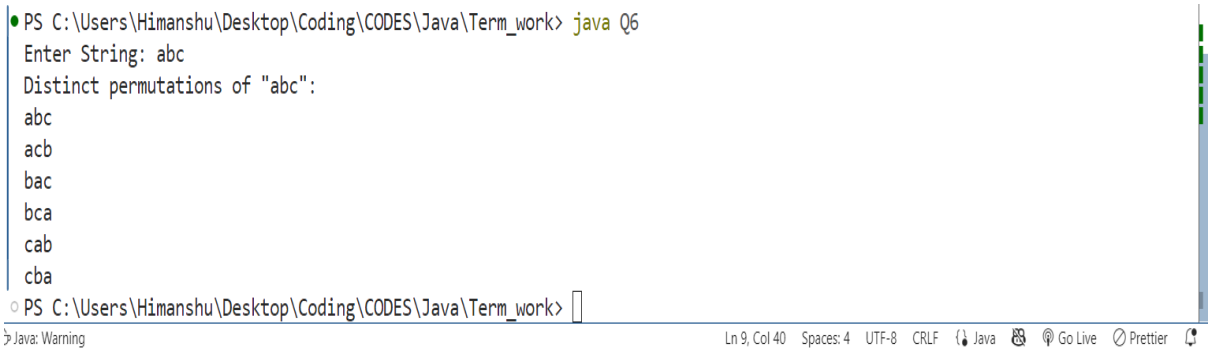
Practical No. 6: Print all permutations of a string in Java and permutations need to be distinct.

Source Code:

```
import java.util.Scanner;

public class Q6 {
    static void sort(char[] arr) {
        int n = arr.length;
        for (int i = 0; i < n - 1; i++) {
            for (int j = 0; j < n - i - 1; j++) {
                if (arr[j] > arr[j + 1]) {
                    char temp = arr[j];
                    arr[j] = arr[j + 1];
                    arr[j + 1] = temp;
                }
            }
        }
    }
    static void generatePermutations(char[] chars, boolean[] used, char[] result, int depth) {
        if (depth == chars.length) {
            System.out.println(new String(result));
            return;
        }

        for (int i = 0; i < chars.length; i++) {
            if (used[i]) continue;
            if (i > 0 && chars[i] == chars[i - 1] && !used[i - 1]) continue;

            used[i] = true;
            result[depth] = chars[i];
```

```
            generatePermutations(chars, used, result, depth + 1);
            used[i] = false;
        }
    }
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter String: ");
        String str = sc.nextLine();
        char[] chars = str.toCharArray();
        sort(chars);
        boolean[] used = new boolean[chars.length];
        char[] result = new char[chars.length];
        System.out.println("Distinct permutations of \"" + str + "\":");
        generatePermutations(chars, used, result, 0);
        sc.close();
    }
}
```

Output:


PS C:\Users\Himanshu\Desktop\Coding\CODES\Java\Term_work> java Q6
Enter String: abc
Distinct permutations of "abc":
abc
acb
bac
bca
cab
cba
PS C:\Users\Himanshu\Desktop\Coding\CODES\Java\Term_work>
Java: Warning
Ln 9, Col 40
Spaces: 4
UTF-8
CRLF
Java
Go Live
Prettier

Practical No. 7: Find out if there are any occurrences of the word "city" in a sentence: Example: Input: I love my city. My city is clean. It is a popular city.

Source Code:

```
import java.util.Scanner;

public class Q7 {
   static int countOccurance(String[] arr, String word)
   {
      int count = 0;
      for(String s : arr)
      {
         if(s.equals(word))
         count++;
      }
      return count;
   }
   public static void main(String args[])
   {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter a String: ");
      String sent = sc.nextLine();
      System.out.print("Enter target: ");
      String t = sc.nextLine();
      sent = sent.replaceAll("[^a-zA-Z]" , " ").toLowerCase();
      String word[] = sent.split(" ");
      System.out.println("Occurance of " + t + " is: " + countOccurance(word, t));
      sc.close();
   }
}
```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Output:

```
PS C:\Users\Himanshu\Desktop\Coding\CODES\Java\Term_work> javac Q7.java
PS C:\Users\Himanshu\Desktop\Coding\CODES\Java\Term_work> java Q7
Enter a String: I love my city. My city is clean. It is a popular city.
Enter target: city
Occurance of city is: 3
PS C:\Users\Himanshu\Desktop\Coding\CODES\Java\Term_work>
```

Practical No. 8: Check if Email Address is Valid or not in Java.

Source Code:

```
import java.util.regex.*;
import java.util.Scanner;
public class Q8 {
   static boolean verifyEmail(String input)
   {
      String emailRegex = "^[A-Za-z0-9+_.-]+@[A-Za-z0-9.-]+$";
      Pattern pattern = Pattern.compile(emailRegex);
      Matcher matcher = pattern.matcher(input);
      return matcher.matches();
   }
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter Email: ");
      String input = sc.nextLine();
      if(verifyEmail(input))
      {
         System.out.println("Valid Email.");
      }else
      {
         System.out.println("Not a valid Email.");
      }
      sc.close();
   }
}
```

Output:

```
PS C:\Users\Himanshu\Desktop\Coding\CODES\Java\Term_work> javac Q8.java
PS C:\Users\Himanshu\Desktop\Coding\CODES\Java\Term_work> java Q8
Enter Email: admin231@gmail.com
Valid Email.
PS C:\Users\Himanshu\Desktop\Coding\CODES\Java\Term_work> java Q8
Enter Email: Admin&*6@gmail.com
Not a valid Email.
PS C:\Users\Himanshu\Desktop\Coding\CODES\Java\Term_work>
```

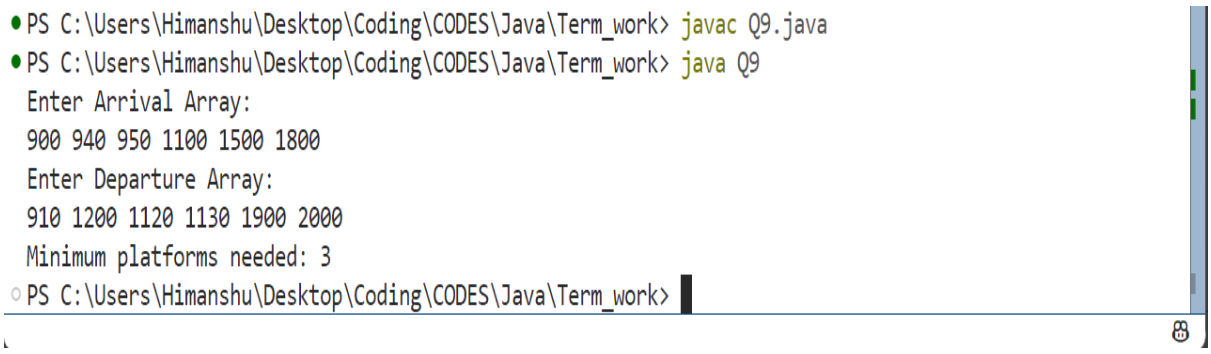
Practical No. 9: We are given two arrays that represent the arrival and departure times of trains, the task is to find the minimum number of platforms required so that no train waits.

Source Code:

```
import java.util.Arrays;

import java.util.Scanner;

public class Q9 {


   static int findMinPlatforms(int[] arrival, int[] departure) {
      int n = arrival.length;
      Arrays.sort(arrival);
      Arrays.sort(departure);
      int platforms = 1, maxPlatforms = 1;
      int i = 1, j = 0;
      while (i < n && j < n) {
         if (arrival[i] <= departure[j]) {
            platforms++;
            i++;
         } else {
            platforms--;
            j++;
         }
         maxPlatforms = Math.max(maxPlatforms, platforms);
      }
      return maxPlatforms;
   }


   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      int[] arrival = new int[5];
      int[] departure = new int[5];
```

```
        System.out.println("Enter Arrival Array: ");
        for(int i = 0 ; i < 5; i++)
        {
            arrival[i] = sc.nextInt();
        }
        System.out.println("Enter Departure Array: ");
        for(int i = 0 ; i < 5; i++)
        {
            departure[i] = sc.nextInt();
        }
        System.out.println("Minimum platforms needed: " + findMinPlatforms(arrival,
departure));
        sc.close();
    }
}
```

Output:


PS C:\Users\Himanshu\Desktop\Coding\CODES\Java\Term_work> javac Q9.java
PS C:\Users\Himanshu\Desktop\Coding\CODES\Java\Term_work> java Q9
Enter Arrival Array:
900 940 950 1100 1500 1800
Enter Departure Array:
910 1200 1120 1130 1900 2000
Minimum platforms needed: 3
PS C:\Users\Himanshu\Desktop\Coding\CODES\Java\Term_work>

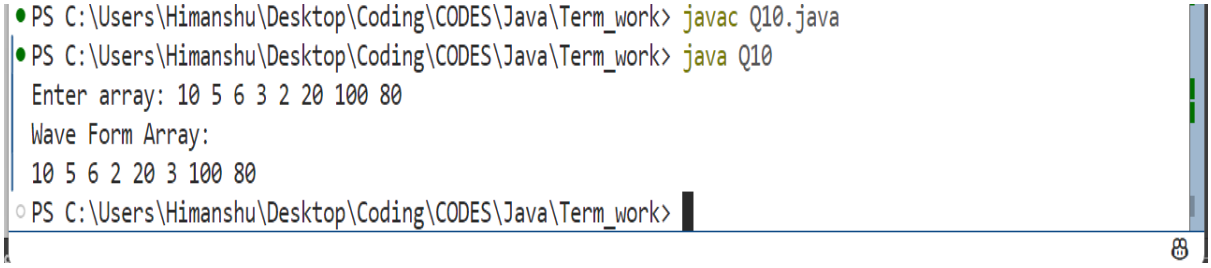
Practical No. 10: Given an unsorted array of integers, sort the array into a wave array. An array arr[0..n-1] is sorted in wave form if:
arr[0] >= arr[1] <= arr[2] >= arr[3] <= arr[4] >= .....

Source Code:

```
import java.util.Arrays;

import java.util.Scanner;

public class Q10 {


   static void convertWave(int[] arr) {
      int n = arr.length;
      for (int i = 0; i < n - 1; i += 2) {
         if (i > 0 && arr[i] < arr[i - 1]) {
            int temp = arr[i];
            arr[i] = arr[i - 1];
            arr[i - 1] = temp;
         }
         if (i < n - 1 && arr[i] < arr[i + 1]) {
            int temp = arr[i];
            arr[i] = arr[i + 1];
            arr[i + 1] = temp;
         }
      }
   }


   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter array: ");
      int arr[] = new int[8];
      for(int i = 0 ; i < 8 ; i++)
      {
```

```
            arr[i] = sc.nextInt();
        }
        convertWave(arr);
        System.out.println("Wave Form Array:");
        for(int x: arr)
        {
            System.out.print(x);
        }
        sc.close();

    }
}
```

Output:


PS C:\Users\Himanshu\Desktop\Coding\CODES\Java\Term_work> javac Q10.java
PS C:\Users\Himanshu\Desktop\Coding\CODES\Java\Term_work> java Q10
Enter array: 10 5 6 3 2 20 100 80
Wave Form Array:
10 5 6 2 20 3 100 80
PS C:\Users\Himanshu\Desktop\Coding\CODES\Java\Term_work>