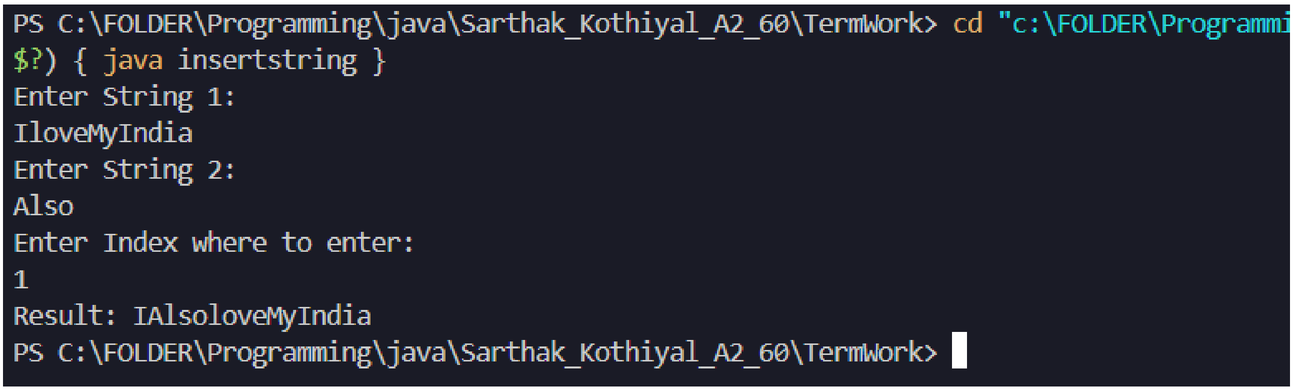
Practical No. 1:

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;

public class insertstring{
    public static String insert(String s1, String s2, int index){
        char[] str1=s1.toCharArray();
        char[] str2=s2.toCharArray();
        char[] result=new char[str1.length+str2.length];
        int i=0,j=0;
        while(i<index){
            result[j++]=str1[i++];
        }
        for(char c:str2){
            result[j++]=c;
        }
        while(i<str1.length){
            result[j++]=str1[i++];
        }
        String newstr= "";
        for(char c:result){
            newstr+=c;
        }
        return newstr;
    }

    public static void main(String[] args){
        Scanner sc=new Scanner(System.in);
        System.out.println("Enter String 1: ");
        String s1=sc.nextLine();
        System.out.println("Enter String 2: ");
        String s2=sc.nextLine();
        System.out.println("Enter Index where to enter: ");
        int index=sc.nextInt();
        String result=insert(s1,s2,index);
        System.out.println("Result: " + result);
    }
}
```

Output:



```
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork> cd "c:\FOLDER\Programmi
$?) { java insertstring }
Enter String 1:
IloveMyIndia
Enter String 2:
Also
Enter Index where to enter:
1
Result: IAlsoloveMyIndia
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork> 
```

Practical No. 2:

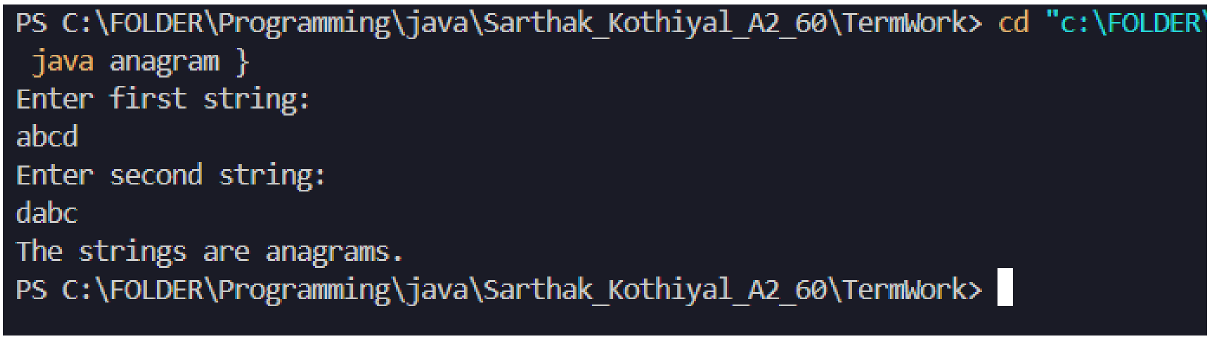
Write a program to check two strings are Anagram of each other.

Source Code:

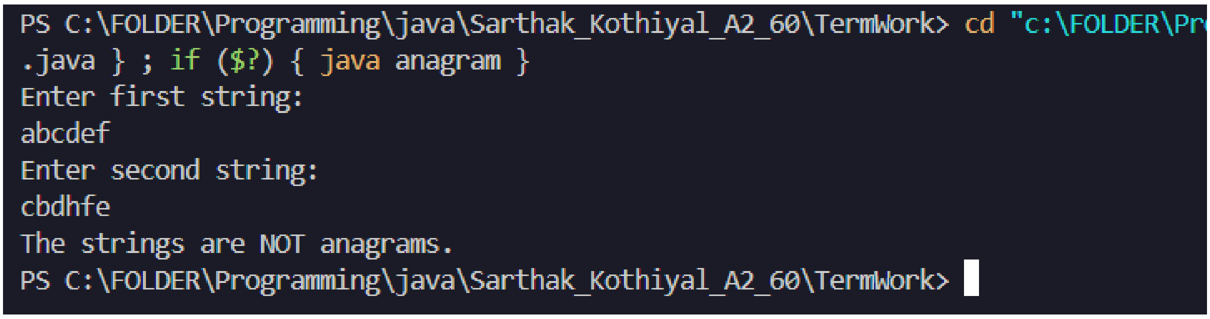
```
import java.util.Arrays;
import java.util.Scanner;

public class anagram{

  public static boolean check(String s1, String s2) {
    s1 = s1.replaceAll("\\s", "").toLowerCase();
    s2 = s2.replaceAll("\\s", "").toLowerCase();
    if (s1.length() != s2.length()) {
      return false;
    }
    char[] a1 = s1.toCharArray();
    char[] a2 = s2.toCharArray();
    Arrays.sort(a1);
    Arrays.sort(a2);
    return Arrays.equals(a1, a2);
  }

  public static void main(String[] args) {
    Scanner sc = new Scanner(System.in);
    System.out.println("Enter first string:");
    String str1 = sc.nextLine();
    System.out.println("Enter second string:");
    String str2 = sc.nextLine();

    if (check(str1, str2)) {
      System.out.println("The strings are anagrams.");
    }
```

```
        else {
            System.out.println("The strings are NOT anagrams.");
        }
    }
}
```

Output:



```
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork> cd "c:\FOLDER\
 java anagram }
Enter first string:
abcd
Enter second string:
dabc
The strings are anagrams.
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork> 
```



```
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork> cd "c:\FOLDER\Pr
.java } ; if ($?) { java anagram }
Enter first string:
abcdef
Enter second string:
cbdhfe
The strings are NOT anagrams.
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork> 
```

Practical No. 3:

Java program for Sorting a String

(i)Without using any inbuilt sorting functions

(ii) By using inbuilt functions

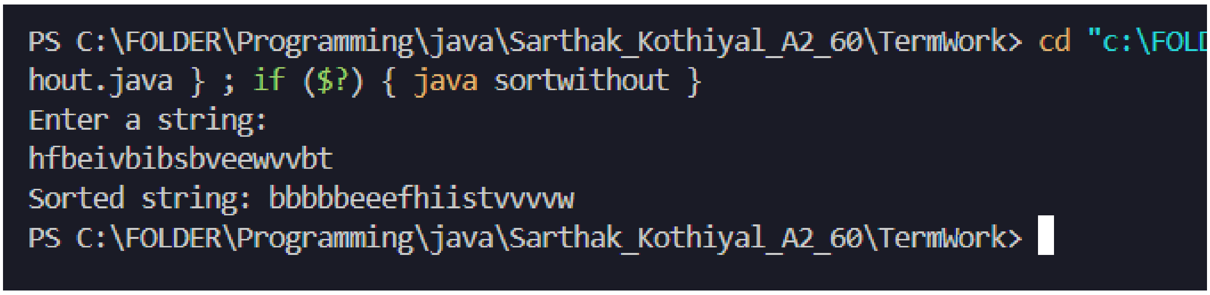
Source Code:

(i)Without using any inbuilt sorting functions

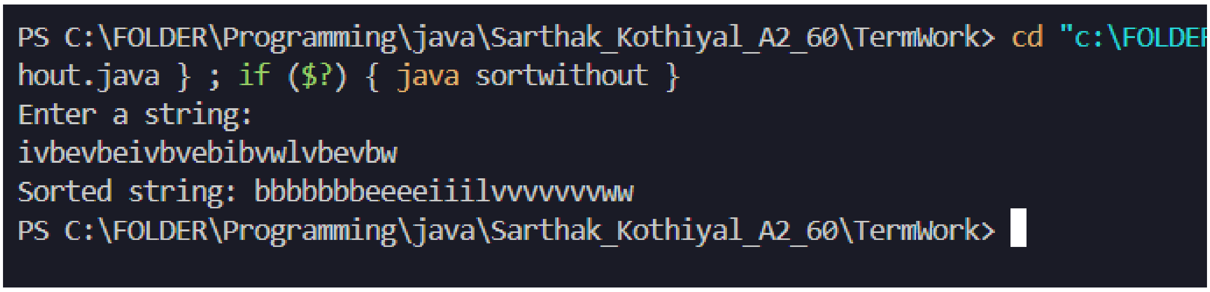
```
import java.util.Scanner;

public class sortwithout {

   public static String sortString(String input) {
      char[] chars = input.toCharArray();
      for (int i = 0; i < chars.length - 1; i++) {
         for (int j = 0; j < chars.length - i - 1; j++) {
            if (chars[j] > chars[j + 1]) {
               char temp = chars[j];
               chars[j] = chars[j + 1];
               chars[j + 1] = temp;
            }
         }
      }
      String sorted = "";
      for (char c : chars) {
         sorted += c;
      }
      return sorted;
   }
```

```
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter a string:");
        String input = sc.nextLine();
        String sorted = sortString(input);
        System.out.println("Sorted string: " + sorted);
    }
}
```

Output:



```
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork> cd "c:\FOLD
hout.java } ; if ($?) { java sortwithout }
Enter a string:
hfbeivbibsbveewvvbt
Sorted string: bbbbbeeefhiistvvvvw
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork>
```

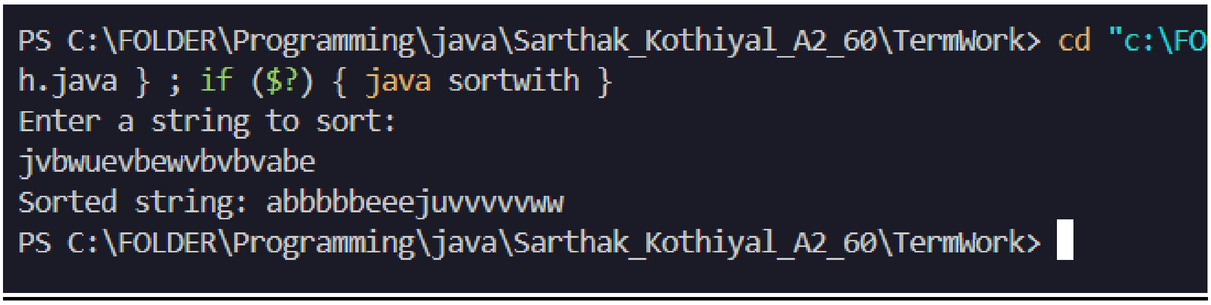


```
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork> cd "c:\FOLDEF
hout.java } ; if ($?) { java sortwithout }
Enter a string:
ivbevbeivbvebibvwlvbevbw
Sorted string: bbbbbbbeeeeiiilvvvvvvvww
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork>
```

(ii) By using inbuilt functions

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

public class sortwith {
   public static String sortString(String input) {
      char[] chars = input.toCharArray();
      Arrays.sort(chars);
      return new String(chars);
   }
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.println("Enter a string to sort (using inbuilt sort):");
      String input = sc.nextLine();
      String sorted = sortString(input);
      System.out.println("Sorted string: " + sorted);
   }
}
```

OUTPUT:



```
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork> cd "c:\FO
h.java } ; if ($?) { java sortwith }
Enter a string to sort:
jvbwuevbewvbvbvabe
Sorted string: abbbbbeeejuvvvvvww
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork> 
```

Practical No. 4:

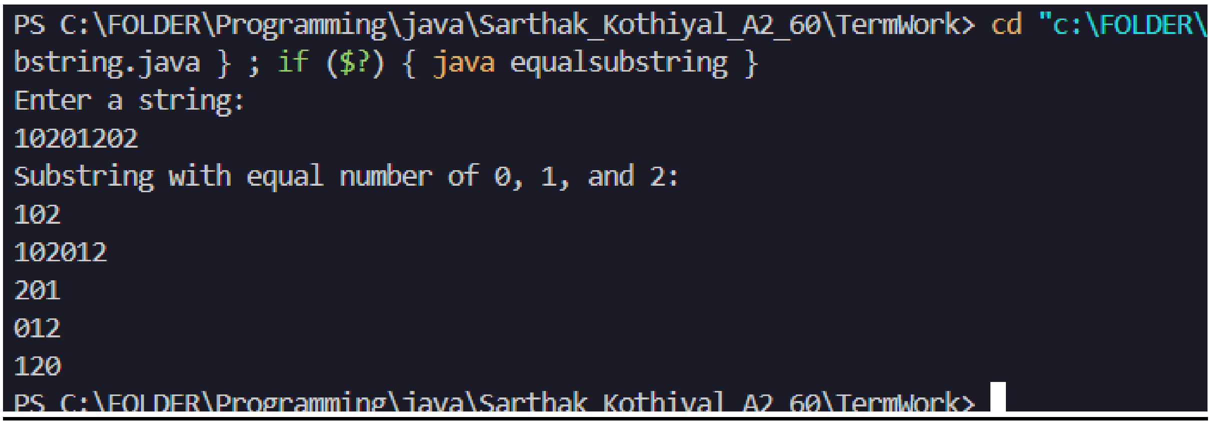
Program to Extract Substring from a String with Equal 0, 1, and 2

Source Code:

```
import java.util.Scanner;

public class equalsubstring {

   public static void find(String str) {
      int n = str.length();
      boolean found = false;
      System.out.println("Substring with equal number of 0, 1, and 2:");
      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 && count0 != 0) {
               found = true;
               System.out.println(str.substring(i, j + 1));
            }
         }
      }
```

```
        if (!found) {
            System.out.println("No substring exist.");
        }
    }

    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter a string:");
        String input = sc.nextLine();
        find(input);
    }
}
```

Output:



```
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork> cd "c:\FOLDER\
bstring.java } ; if ($?) { java equalsubstring }
Enter a string:
10201202
Substring with equal number of 0, 1, and 2:
102
102012
201
012
120
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork>
```

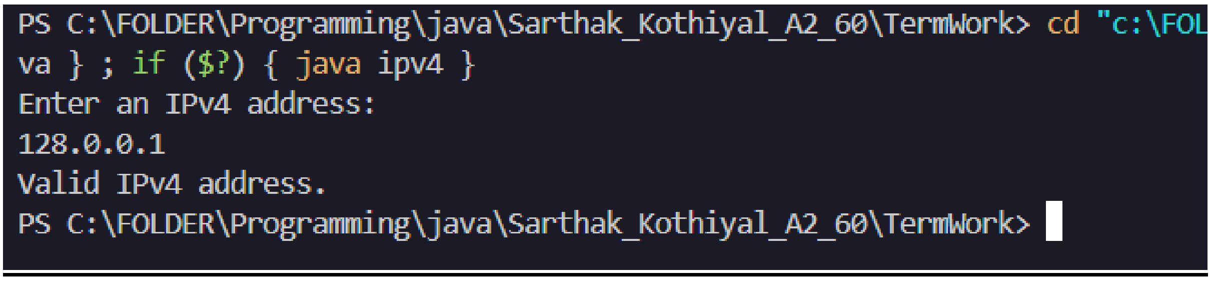
Practical No. 5:

Write a program to validate an IPv4 Address.

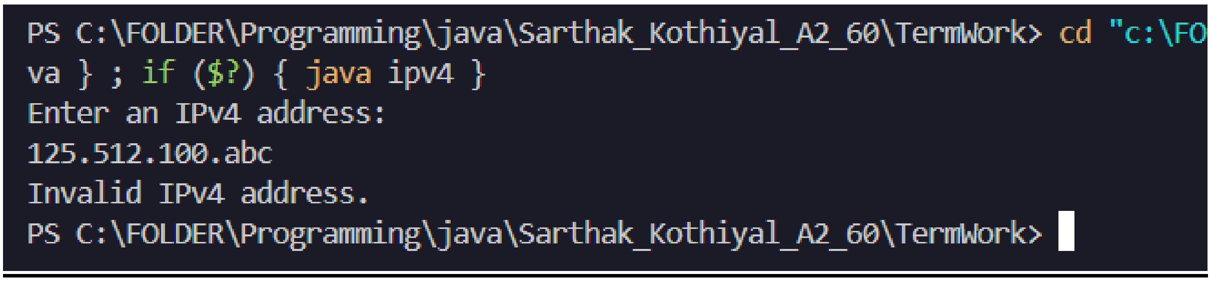
Source Code:

```
import java.util.Scanner;

public class ipv4 {

    public static boolean check(String ip) {
        String[] parts = ip.split("\\.");
        if (parts.length != 4){
            return false;
        }
        for (String part : parts) {
            if (part.length() > 1 && part.startsWith("0")) {
                return false;
            }
            int num = Integer.parseInt(part);
            if (num < 0 || num > 255){
                return false;
            }
        }
        return true;
    }

    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter an IPv4 address:");
        String ip = sc.nextLine();
        if(check(ip)) {
            System.out.println("Valid IPv4 address.");
        }
        else {
            System.out.println("Invalid IPv4 address.");
        }
    }
}
```

Output:



```
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork> cd "c:\FOL
va } ; if ($?) { java ipv4 }
Enter an IPv4 address:
128.0.0.1
Valid IPv4 address.
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork>
```



```
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork> cd "c:\FO
va } ; if ($?) { java ipv4 }
Enter an IPv4 address:
125.512.100.abc
Invalid IPv4 address.
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork>
```

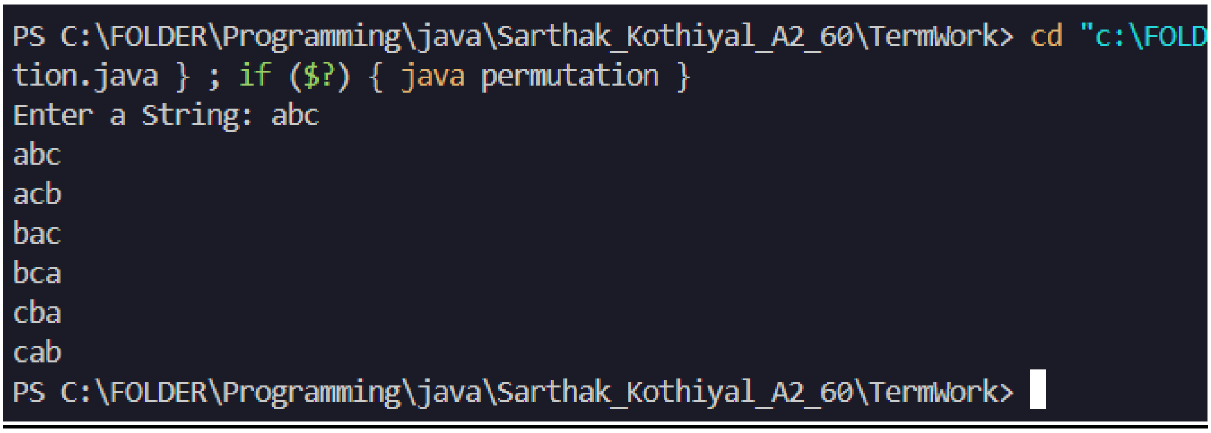
Practical No. 6:

Print all permutations of a string in Java and permutations need to be distinct.

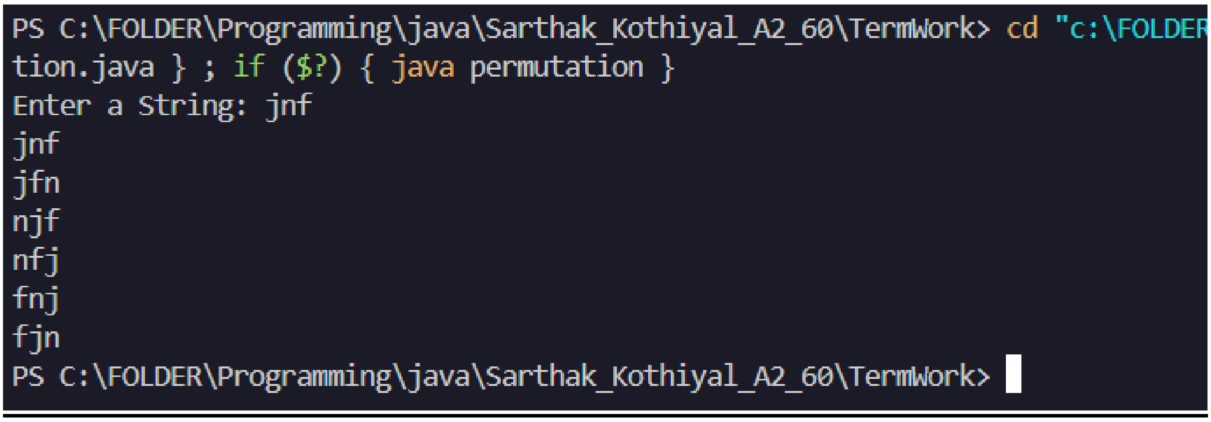
Source Code:

```
import java.util.*;

public class permutation{
   static void swap(StringBuffer str,int a,int b){
      char ch=str.charAt(a);
      str.setCharAt(a,str.charAt(b));
      str.setCharAt(b,ch);
   }

   static void permu(StringBuffer str,int low,int high){
      if(low==high){
         System.out.println(str);
         return;
      }
      for(int i=low;i<=high;i++){
         swap(str,low,i);
         permu(str,low+1,high);
         swap(str,low,i);
      }
   }
   public static void main(String[] args) {
      Scanner sc=new Scanner(System.in);
      System.out.print("Enter a String: ");
      String str=sc.nextLine();
      StringBuffer s=new StringBuffer(str);
      permu(s,0,str.length()-1);
   }
}
```

Output:



```
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork> cd "c:\FOLD
tion.java } ; if ($?) { java permutation }
Enter a String: abc
abc
acb
bac
bca
cba
cab
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork>
```



```
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork> cd "c:\FOLDER
tion.java } ; if ($?) { java permutation }
Enter a String: jnf
jnf
jfn
njf
nfj
fnj
fjn
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork>
```

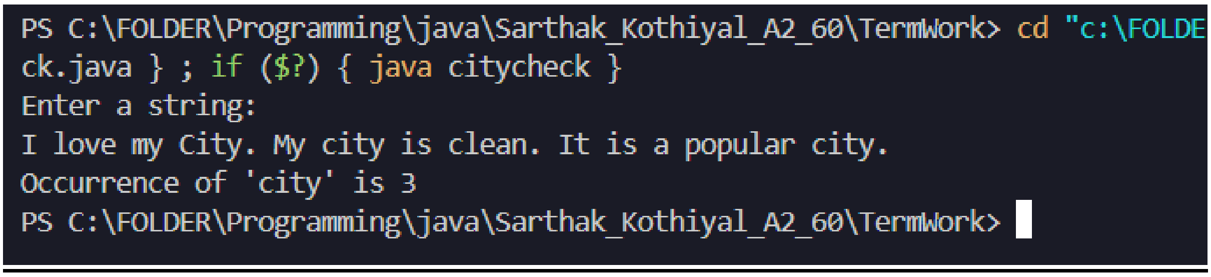
Practical No. 7:

Find out if there are any occurrences of the word "city" in a sentence

Source Code:

```
import java.util.Scanner;
import java.util.regex.Matcher;
import java.util.regex.Pattern;

public class citycheck {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter a string:");
        String str = sc.nextLine();
        Pattern pattern = Pattern.compile("\\bcity\\b", Pattern.CASE_INSENSITIVE);
        Matcher matcher = pattern.matcher(str);
        int count = 0;
        while (matcher.find()) {
            count++;
        }
        System.out.println("Occurrence of 'city' is " + count);
    }
}
```

Output:



```
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork> cd "c:\FOLDE
ck.java } ; if ($?) { java citycheck }
Enter a string:
I love my City. My city is clean. It is a popular city.
Occurrence of 'city' is 3
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork>
```

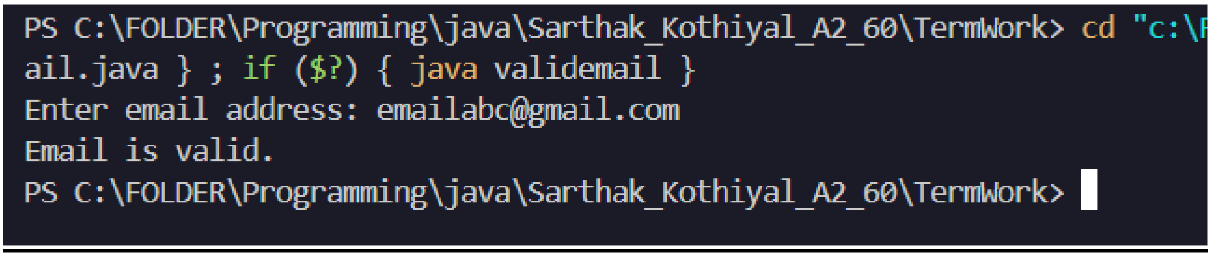
Practical No. 8:

Check if Email Address is Valid or not in Java.

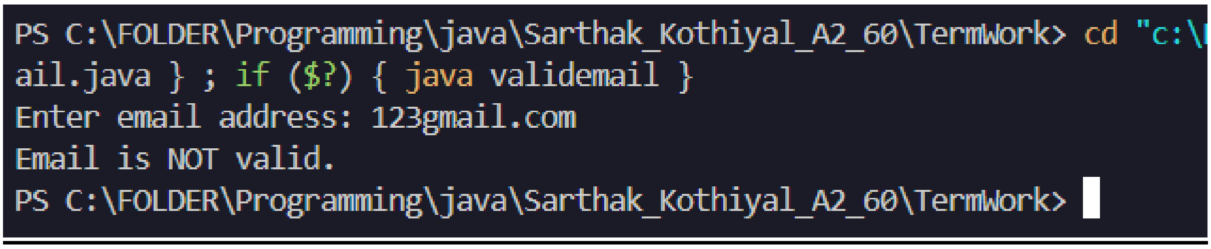
Source Code:

```
import java.util.Scanner;

public class validemail {
    public static boolean check(String email) {
        if (email == null){
            return false;
        }
        int atPos = email.indexOf('@');
        if (atPos <= 0){
            return false;
        }
        int lastAtPos = email.lastIndexOf('@');
        if (atPos != lastAtPos){
            return false;
        }
        int dotPos = email.indexOf('.', atPos);
        if (dotPos == -1 || dotPos == atPos + 1){
            return false;
        }
        if (email.endsWith(".")){
            return false;
        }
        if (email.contains(" ")){
            return false;
        }
        return true;
    }
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter email address: ");
        String email = sc.nextLine();

        if (check(email)) {
            System.out.println("Email is valid.");
        }
        else {
            System.out.println("Email is NOT valid.");
        }
    }
}
```

Output:



```
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork> cd "c:\
ail.java } ; if ($?) { java validemail }
Enter email address: emailabc@gmail.com
Email is valid.
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork> 
```



```
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork> cd "c:\
ail.java } ; if ($?) { java validemail }
Enter email address: 123gmail.com
Email is NOT valid.
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork> 
```

Practical No. 9:

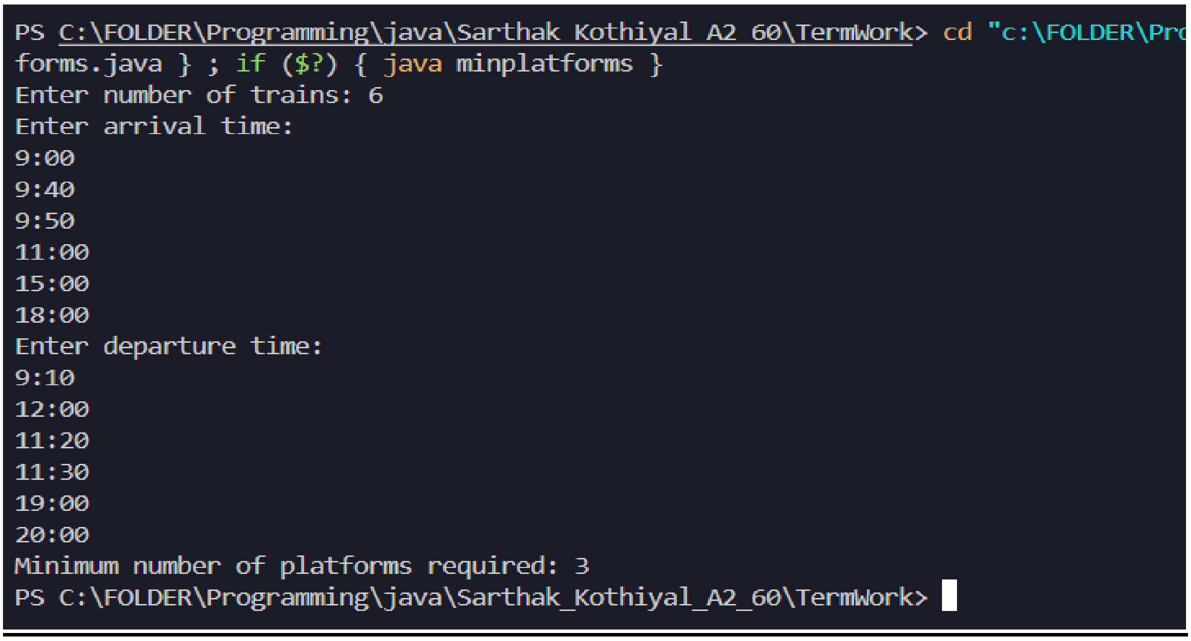
We are given two arrays that represent the arrival and departure times of trains, the task is to find the minimum number of platforms required so that no train waits.

Source Code:

```
import java.util.*;
public class minplatforms {
   private static int toMinutes(String time) {
      String[] parts = time.split(":");
      return Integer.parseInt(parts[0]) * 60 + Integer.parseInt(parts[1]);
   }
   public static int findMinimumPlatforms(String[] arr, String[] dep) {
      int n = arr.length;
      int[] arrival = new int[n];
      int[] departure = new int[n];
      for (int i = 0; i < n; i++) {
         arrival[i] = toMinutes(arr[i]);
         departure[i] = toMinutes(dep[i]);
      }
      Arrays.sort(arrival);
      Arrays.sort(departure);
      int platformsNeeded = 0, maxPlatforms = 0;
      int i = 0, j = 0;
      while (i < n && j < n) {
         if (arrival[i] <= departure[j]) {
            platformsNeeded++;
            i++;
         }
         else {
            platformsNeeded--;
            j++;
         }
         maxPlatforms = Math.max(maxPlatforms, platformsNeeded);
      }
```

```
        return maxPlatforms;
    }
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter number of trains: ");
        int n = sc.nextInt();
        sc.nextLine();
        String[] arrivals = new String[n];
        String[] departures = new String[n];
        System.out.println("Enter arrival time:");
        for (int i = 0; i < n; i++) {
            arrivals[i] = sc.nextLine();
        }
        System.out.println("Enter departure time:");
        for (int i = 0; i < n; i++) {
            departures[i] = sc.nextLine();
        }
        int result = findMinimumPlatforms(arrivals, departures);
        System.out.println("Minimum number of platforms required: " + result);
    }
}
```

Output:



```
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork> cd "c:\FOLDER\Pr
forms.java } ; if ($?) { java minplatforms }
Enter number of trains: 6
Enter arrival time:
9:00
9:40
9:50
11:00
15:00
18:00
Enter departure time:
9:10
12:00
11:20
11:30
19:00
20:00
Minimum number of platforms required: 3
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork> 
```

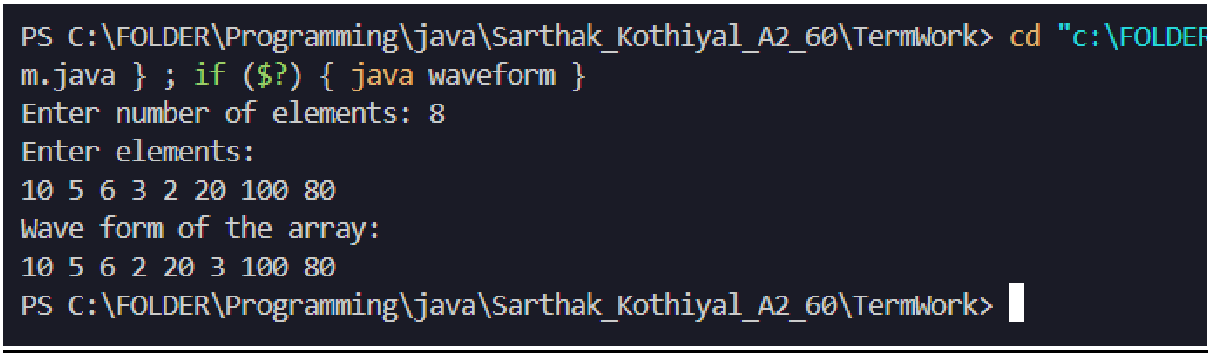
Practical No. 10:

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.Scanner;

public class waveform {
    public static void convertToWave(int[] arr) {
        int n = arr.length;
        for (int i = 0; i < n; i += 2) {
            if (i > 0 && arr[i - 1] > arr[i]) {
                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 number of elements: ");
        int n = sc.nextInt();
        int[] arr = new int[n];
        System.out.println("Enter elements:");
        for (int i = 0; i < n; i++) {
            arr[i] = sc.nextInt();
        }
        convertToWave(arr);
        System.out.println("Wave form of the array:");
        for (int num : arr) {
            System.out.print(num + " ");
        }
        sc.close();
    }
}
```

Output:



```
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork> cd "c:\FOLDER
m.java } ; if ($?) { java waveform }
Enter number of elements: 8
Enter elements:
10 5 6 3 2 20 100 80
Wave form of the array:
10 5 6 2 20 3 100 80
PS C:\FOLDER\Programming\java\Sarthak_Kothiyal_A2_60\TermWork>
```