

**SIKSHA 'O' ANUSANDHAN**  
**DEEMED TO BE UNIVERSITY**

**Admission Batch: 2022**

**Session:23-24**

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**Laboratory Record**

**Algorithms Design 1 (CSE 3131)**

*Submitted by*

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Branch: **CSE**

Semester: **3<sup>rd</sup>**

Section: **2241036**



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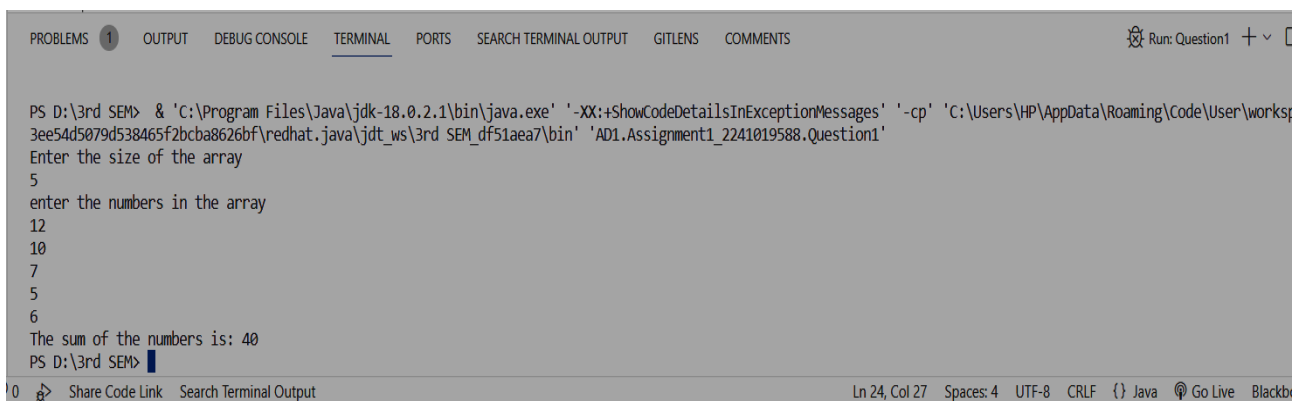
# INDEX

[illegible]

```
// Question-1:
//sum of n numbers in an array using an iterative approach:
package AD1.Assignment1_2241019588;
import java.util.*;
public class Question1
{
    public static void main(String[] args)
    {
        Scanner obj=new Scanner(System.in);
        System.out.println("Enter the size of the array");
        int n=obj.nextInt();
        int[] arr=new int [n]; //Creating an array of nsize
        System.out.println("enter the numbers in the array");
        for (int i = 0; i < n; i++)
            arr[i]=obj.nextInt(); //taking all input in the array
        int sum = 0;
        for (int i = 0; i < n; i++)
            sum += arr[i]; //Calculating the sum in the array
        System.out.println("The sum of the numbers is: "+ sum);
        // Print the result
    }
}

/*Pseudocode :
* Make an array of size n
* Take Input in the array
* initialize sum=0
* for i=0 to n-1 do
*     sum=sum+arr[i]
*     i=i+1
* print sum as result
*/
```

## OUTPUT:



```
PROBLEMS 1 OUTPUT DEBUG CONSOLE TERMINAL PORTS SEARCH TERMINAL OUTPUT GITLENS COMMENTS Run: Question1 + v [
PS D:\3rd SEM> & 'C:\Program Files\Java\jdk-18.0.2.1\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\HP\AppData\Roaming\Code\User\works
3ee54d5079d538465f2bcb8626bf\redhat.java\jdt_ws\3rd SEM_df51aea7\bin' 'AD1.Assignment1_2241019588.Question1'
Enter the size of the array
5
enter the numbers in the array
12
10
7
5
6
The sum of the numbers is: 40
PS D:\3rd SEM> |
0 > Share Code Link Search Terminal Output Ln 24, Col 27 Spaces: 4 UTF-8 CRLF {} Java Go Live Blackb
```

```
//Question-2:
//Find maximum and minimum in an array using an iterative approach:
package AD1.Assignment1_2241019588;
import java.util.*;
public class Question2
{
    public static void main(String[] args)
    {
        Scanner obj=new Scanner(System.in);
        System.out.println("Enter the size of the array");
        int n=obj.nextInt();
        int[] arr=new int [n]; //Creating an array of n size
        System.out.println("enter the numbers in the array");
        for (int i = 0; i < n; i++)
            arr[i]=obj.nextInt(); //taking all input in the array
        // Initialize variables to hold the maximum and minimum values
        int max = Integer.MIN_VALUE;
        int min = Integer.MAX_VALUE;
        for (int i = 0; i < n; i++)
        {
            if (arr[i] > max)
                max = arr[i]; // Update the maximum value
            if (arr[i] < min)
                min = arr[i]; // Update the minimum value
        }
        // Print the maximum and minimum values
        System.out.println("In the array Maximum value: " + max+"and
Minimum value: " + min);
    }
}

/*
 * pseudocode :
 * Make an array of size n
 * Take Input in the array
 * for i = 1 to n- 1 do
     Check if the current element is greater than the current maximum
     if arr[i] > max
     then
         max = arr[i] //Update the maximum value

     Check if the current element is less than the current minimum
     if numbers[i] < min then
         min = numbers[i] // Update the minimum value
     end if
 end for
Print the maximum and minimum values
 */
```

## OUTPUT:

```
PROBLEMS 2 OUTPUT DEBUG CONSOLE TERMINAL PORTS SEARCH TERMINAL OUTPUT GITLENS COMMENTS
Roaming\Code\User\workspaceStorage\cf53ee54d5079d538465f2bcba8626bf\redhat.java\jdt_ws\3rd_SEM_df51a
Question2'
Enter the size of the array
5
enter the numbers in the array
15
16
10
12
8
In the array Maximum value: 16
and Minimum value: 8
PS D:\3rd SEM>
Share Code Link Search Terminal Output Ln 27, Col 69 Spaces: 4 UTF-8 CRLF
```

// Question-3:

//Rotating array By k position using an iterative approach:

```
package AD1.Assignment1_2241019588;
```

```
import java.util.*;
```

```
public class Question3
```

```
{
```

```
    public static void main(String[] args)
```

```
    {
```

```
        Scanner obj=new Scanner(System.in);
```

```
        System.out.println("Enter the size of the array");
```

```
        int n=obj.nextInt();
```

```
        int[] arr=new int [n]; //Creating an array of n size
```

```
        System.out.println("enter the numbers in the array");
```

```
        for (int i = 0; i < n; i++)
```

```
            arr[i]=obj.nextInt(); //taking all input in the array
```

```
        System.out.println("Enter k :");
```

```
        int k=obj.nextInt();
```

```
        k=k%n;
```

```
        for(int i=1;i<=k;i++)
```

```
        {
```

```
            int temp=arr[0];
```

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

```
            {
```

```
                arr[j]=arr[j+1];
```

```
            }
```

```
            arr[n-1]=temp;
```

```
        }
```

```
        System.out.println("The Rotated array is : ");
```

```
        for (int i = 0; i < n; i++)
```

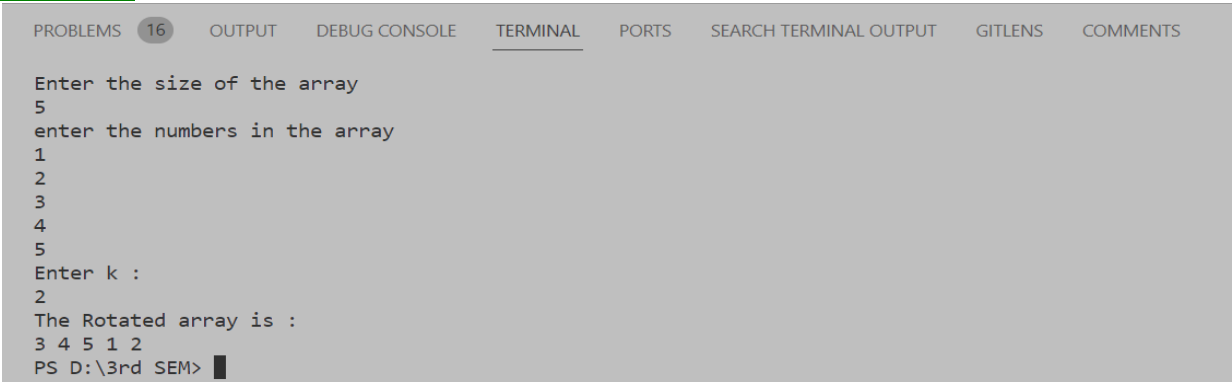
```
            System.out.println(arr[i]+" ");
```

```
    }
```

```
}
```

```
/* Pseudocode :  
* Make an array of size n  
* Take Input in the array  
* Take value of k  
* use k%n and assign to k  
* for i = 1 to k do  
*   assign temp=arr[0]  
*   for j = 1 to n-1 do  
*     then shift all element by left one position  
*     assign temp to the last element of the array  
*   end for  
* end for  
* print the rotated array */
```

## OUTPUT



```
PROBLEMS 16 OUTPUT DEBUG CONSOLE TERMINAL PORTS SEARCH TERMINAL OUTPUT GITLENS COMMENTS  
  
Enter the size of the array  
5  
enter the numbers in the array  
1  
2  
3  
4  
5  
Enter k :  
2  
The Rotated array is :  
3 4 5 1 2  
PS D:\3rd SEM>
```

```
// Question-4:  
//Finding the largest sum contiguous subarray using an iterative approach:  
package AD1.Assignment1_2241019588;  
import java.util.*;  
public class Question4  
{  
    public static void main(String[] args)  
    {  
        Scanner obj=new Scanner(System.in);  
        System.out.println("Enter the size of the array");  
        int n=obj.nextInt();  
        int[] arr=new int [n]; //Creating an array of n size  
        System.out.println("enter the numbers in the array");  
        for (int i = 0; i < n; i++)  
            arr[i]=obj.nextInt(); //taking all input in the array  
        // Initialize variables to hold the maximum sum value  
        int maxSum = Integer.MIN_VALUE;  
        int currSum = arr[0];  
        for (int i = 0; i <= n - 1; i++)  
        {  
            currSum=Math.max(arr[i], currSum+arr[i]);  
            if (currSum > maxSum)  
                maxSum = currSum;  
        }  
        System.out.println("The maximum sum is "+maxSum);  
    }  
}
```

```
/* pseudocode :
 * Make an array of size n
 * Take Input in the array
 * Maxsum=arr[0] (Initialize MaxSum to the first element)
 * currentSum = arr[0] (Initialize currentSum to the first element)
 * for i = 1 to n- 1 do\
 *     Choose the maximum between the current element and the sum of the
current element and currentSum
    currentSum = max(arr[i], currentSum + arr[i])
    Update maxSum if the currentSum is greater
    if (currSum > maxSum)
        maxSum = currSum;
 * Print maxSum
 */
```

## OUTPUT:

PROBLEMS 16 OUTPUT DEBUG CONSOLE TERMINAL PORTS SEARCH TERMINAL

```
Users\HP\AppData\Roaming\Code\User\workspaceStorage\cf53ee54d5079d53
\bin' 'AD1.Assignment1_2241019588.Question4'
Enter the size of the array
8
enter the numbers in the array
-5 -4 5 -1 -2 2 5 -3
The maximum sum is 9
PS D:\3rd SEM>
```

```
// Question-5:
//Smallest positive missing number in an array using an iterative approach:
package AD1.Assignment1_2241019588;
import java.util.*;
public class Question5
{
    public static void main(String[] args)
    {
        Scanner obj=new Scanner(System.in);
        System.out.println("Enter the size of the array");
        int n=obj.nextInt();
        int[] arr=new int [n]; //Creating an array of n size
        System.out.println("enter the numbers in the array");
        for (int i = 0; i < n; i++)
            arr[i]=obj.nextInt(); //taking all input in the array]
        boolean found;
```

```
for (int i = 1;; i++)  
{  
    found = false;  
    for (int j = 0; j < n; j++) {  
        if (arr[j] == i)  
        {  
            found = true;  
            break;  
        }  
    }  
    if (found==false)  
    {  
        System.out.println("Missing smallest positive number  
        is"+i);  
        break;  
    }  
}  
}
```

```
/* Pseudocode :  
 * Make an array of size n  
 * Take Input in the array  
 * initialize found as a boolean  
 * for i = 1 do  
 *     for j=0 to j<n do  
 *         search for i in the array  
 *     if found then j++  
 * if not found then print i as smallest positive missing number  
 */
```

## OUTPUT:

PROBLEMS 16 OUTPUT DEBUG CONSOLE TERMINAL PORTS SEARCH

```
Enter the size of the array  
5  
enter the numbers in the array  
1  
2  
3  
4  
6  
Missing smallest positive number is 5  
PS D:\3rd SEM> █
```



```
// Question-6:
//Sort the array in maximum minimum... in an array using an iterative
approach:
package AD1.Assignment1_2241019588;
import java.util.*;
public class Question6
{
    public static void main(String[] args)
    {
        Scanner obj=new Scanner(System.in);
        System.out.println("Enter the size of the array");
        int n=obj.nextInt();
        int[] arr=new int [n]; //Creating an array of n size
        System.out.println("enter the numbers in the array");
        for (int i = 0; i < n; i++)
            arr[i]=obj.nextInt(); //taking all input in the array
        for (int i = 0; i < arr.length; i++)
            for (int j = i + 1; j < arr.length; j++)
            {
                int temp = 0;
                if (arr[i] > arr[j])
                {
                    temp = arr[i];
                    arr[i] = arr[j];
                    arr[j] = temp;
                }
            }
        int temp[] =new int[n];
        for (int i = 0,j=0,k=n-1; i < n; i++)
        {
            if(i%2==0){
                temp[i]=arr[k];
                k--;
            }
            else
            {
                temp[i]=arr[j];
                j++;
            }
        }
        System.out.println("new max min sort array is :");
        for (int i = 0; i < n; i++)
            System.out.println(temp[i]+ " ");
    }
}
```

```
/*  
 * Pseudocode :  
 * Make an array of size n  
 * Take Input in the array  
 * Sort the array  
 * make a temp array of n size  
 * for i=0,j=0,k=n-1 to i<n-1 do  
 * if(i%2==0)  
 *     temp[i]=arr[k]  
 *     k--  
 * else  
 *     temp[i]=arr[j]  
 *     j++  
 * end for  
 * print the array  
 */
```

## OUTPUT

PROBLEMS 16 OUTPUT DEBUG CONSOLE TERMINAL PORTS SEARCH TERMINAL OUTPUT GITLENS

Question6'

Enter the size of the array

6

enter the numbers in the array

1

2

3

4

5

6

new max min sort array is :

6 1 5 2 4 3

PS D:\3rd SEM> █

```
// Question-7:
//Factorial of a number by using an iterative approach:
package AD1.Assignment1_2241019588;
import java.util.*;
public class Question7
{
    public static void main(String[] args)
    {
        Scanner obj=new Scanner(System.in);
        System.out.println("Enter the number");
        int n=obj.nextInt();
        int fact=1;
        while(n>0)
        {
            fact*=n;
            n--;
        }
        System.out.println("The factorial is "+fact);
    }
}
/*
 * Pseudocode :
 * enter a nonnegative number n
 * initialize fact as 1
 * while n>0 do
 *     fact=fact*n;
 *     n=n-1;
 * end while
 * print fact as result
 */
```

OUTPUT:

```
Question7'
Enter the number
5
The factorial is 120
```

---

```
// Question-8:
//nth Fiboacci number by using an iterative approach:
package AD1.Assignment1_2241019588;
import java.util.*;
public class Question8
{
    public static void main(String[] args)
    {
        Scanner obj=new Scanner(System.in);
        System.out.println("Enter the n : ");
        int n=obj.nextInt();
        int a=0,b=1,sum=1;
        for(int i=2;i<n;i++)
        {
            sum=a+b;
            a=b;
            b=sum;
        }
        System.out.println("The "+n+"th fibonacci number is "+sum);
    }
}
/*
 * Pseudocode :
 * enter a nonnegative number n
 * initialize a=0,b=1,sum=1
 * for i=2 to n-1 do
 *     sum=a+b
 *     a=b
 *     b=sum
 * }
 * end for
 * print that sum
 */
```

### OUTPUT:

```
Enter the n :
10
The 10th fibonacci number is 34
```

```
// Question-1:
//sum of n numbers in an array using recursion:
package AD1.Assignment2_2241019588;
import java.util.*;
public class Question1
{
    public static void main(String[] args)
    {
        Scanner obj=new Scanner(System.in);
        System.out.println("Enter the size of the array");
        int n=obj.nextInt();
        int[] arr=new int [n]; //Creating an array of n size
        System.out.println("enter the numbers in the array");
        for (int i = 0; i < n; i++)
            arr[i]=obj.nextInt();
        System.out.println("The sum is "+Sum(arr,n));
    }
    public static int Sum(int[] arr,int n)
    {
        if(n<=0)
            return 0;
        return (Sum(arr,n-1)+arr[n-1]);
    }
}
```

```
/*pseudocode :
* Make an array of size n
* Take Input in the array
* make a function sum()
* if n<=0
*     return 0
*     return (sum(arr,n-1)+arr[n-1]);
* print sum() as result
*/
```

### **OUTPUT:**

```
' 'AD1.Assignment2_2241019588.Question1'
Enter the size of the array
5
enter the numbers in the array
3
4
6
8
9
The sum is 30
```

---

```
// Question-2:
//.Finding maximum and minimum in an array using recursion:
package AD1.Assignment2_2241019588;
import java.util.*;
public class Question2
{
    public static void main(String[] args)
    {
        Scanner obj=new Scanner(System.in);
        System.out.println("Enter the size of the array");
        int n=obj.nextInt();
        int[] arr=new int [n]; //Creating an array of n size
        System.out.println("enter the numbers in the array");
        for (int i = 0; i < n; i++)
            arr[i]=obj.nextInt();
        System.out.println("The Minimum is "+Min(arr,n));
        System.out.println("The Max is "+Max(arr,n));
    }
    public static int Min(int[] a,int n)
    {
        if(n == 1)
            return a[0];

        return Math.min(a[n-1], Min(a, n-1));
    }
    public static int Max(int[] a,int n)
    {
        if(n == 1)
            return a[0];

        return Math.max(a[n-1],Max(a, n-1));
    }
}
/*pseudocode :
* Make an array of size n
* Take Input in the array
* make a function Min() to find the minimum
*     if(n == 1)
*         return a[0];
*     return Math.min(a[n-1], Min(a, n-1));
* make a function Max() to find the maximum
*     if(n == 1)
*         return a[0];
*     return Math.max(a[n-1],Max(a, n-1));
* print Min() and Max() as result
*/
```

**OUTPUT:**

```
'AD1.Assignment2_2241019588.Question2'  
Enter the size of the array  
5  
enter the numbers in the array  
14  
12  
16  
8  
11  
The Minimun is 8  
The Max is 16  
PS D:\3rd SEM\AD1\Assignment2_2241019588> █
```

```
// Question-3:  
//Factorial of a number using recursion:  
package AD1.Assignment2_2241019588;  
  
import java.util.Scanner;  
  
public class Question3  
{  
    public static void main(String[] args) {  
        Scanner obj=new Scanner(System.in);  
        System.out.println("Enter the number");  
        int n=obj.nextInt();  
        System.out.println("The factorial is : "+Fact(n));  
    }  
    public static int Fact(int x)  
    {  
        if(x == 0)  
            return 1;  
  
        return x*Fact(x-1);  
    }  
}  
/*Pseudocode :  
* enter a nonnegative number n  
* Create a Fucntion Fact  
    if(x == 0)  
        return 1;  
    return x*Fact(x-1);  
* print fact() as result  
*/
```

**OUTPUT:**

```
Enter the number  
5  
The factorial is : 120
```

```
// Question-4:
//Generating nth Fibonacci number using recursion:
package AD1.Assignment2_2241019588;
import java.util.*;
public class Question4
{
    public static void main(String[] args) {
        Scanner obj=new Scanner(System.in);
        System.out.println("Enter the n");
        int n=obj.nextInt();
        System.out.println("The nth fibbonacci number is : "
+Fibo(n));
    }
    public static int Fibo(int x)
    {
        if(x == 0)
            return 0;
        if(x == 1)
            return 1;

        return Fibo(x-1)+Fibo(x-2);
    }
}
/*Pseudocode :
* enter a nonnegative number n
* Create a Fucntion Fibo()
*   if(x == 0)
*       return 0
*   if(x == 1)
*       return 1
*   return Fibo(x-1)+Fibo(x-2)
*/
```

**OUTPUT:**

Enter the n

10

The 10th fibbonacci number is : 55



```
// Question-5:
//Finding GCD between two numbers using recursion :
package AD1.Assignment2_2241019588;
import java.util.*;
public class Question5
{
    public static void main(String[] args) {
        Scanner obj=new Scanner(System.in);
        System.out.println("Enter two number");
        int a=obj.nextInt();
        int b=obj.nextInt();
        System.out.println("The GCD of "+a+" and "+b+" is :
"+findGCD(a,b));
    }
    public static int findGCD(int x,int y)
    {
        if(y==0)
            return x;
        return (findGCD(y, x%y));
    }
}
/*Pseudocode :
* enter a nonnegative number n
* Create a Fucntion FindGCD()
    if(y==0)
        return x
    return (findGCD(y, x%y))
*print findGCD()
*/
```

**OUTPUT :**

Enter two number

7

49

The GCD of 7 and 49 is : 7

```
// Question-6:
//Conversion from decimal to hexadecimal numbers using recursion:
package AD1.Assignment2_2241019588;
import java.util.*;
public class Question6
{
    static char[] hexChar = {'0', '1', '2', '3', '4', '5', '6', '7',
        '8', '9', 'A', 'B', 'C', 'D', 'E', 'F'};
    static String strHex = "";
    public static void main(String[] args)
    {
        Scanner obj=new Scanner(System.in);
        System.out.println("Enter the Decimal number");
        int d=obj.nextInt();
        String hex=DectoHex(d);
        System.out.println("The Hexadecimal number is "+hex);
    }
    public static String DectoHex(int dec)
    {
        if(dec == 0)
            return strHex;

        int num = dec % 16;
        strHex = hexChar[num] + strHex;
        dec = dec / 16;
        DectoHex(dec);

        return strHex;
    }
}
/*Pseudocode :
* enter a nonnegative number n
* create a static char array
* create a static string strHex
* Create a Fucntion DectoHex()
    if(dec == 0)
        return strHex
    int num = dec % 16
    strHex = hexChar[num] + strHex
    dec = dec / 16
    DectoHex(dec)
    return strHex
*print strHex
*/
```

**OUTPUT:**

```
Enter the Decimal number
170
The Hexadecimal number is AA
```

```
// Question-7 :  
//Computing nth power of a number using recursion:  
package AD1.Assignment2_2241019588;  
import java.util.*;  
public class Question7  
{  
    public static void main(String[] args) {  
        Scanner obj=new Scanner(System.in);  
        System.out.println("Enter the number");  
        int n=obj.nextInt();  
        System.out.println("Enter the power");  
        int p=obj.nextInt();  
        System.out.println(n+" power of "+p+" is : "+findPower(n,p));  
    }  
    public static int findPower(int n,int p)  
    {  
        if(p==0)  
            return 1;  
        return n*(findPower(n, p-1));  
    }  
}  
/*Pseudocode :  
* enter a nonnegative number n  
* enter the power  
*  
* Create a Fucntion findPower()  
*   if(p==0)  
*       return 1  
*   return n*(findPower(n, p-1))  
*print findPower()  
*/
```

**OUTPUT:**

Enter the number

5

Enter the power

2

5 power of 2 is : 25

PS D:\3rd SEM\AD1\Assignment2\_2241019588> █

```
// Question-8:
//Smallest positive missing number in an array using recursion :
package AD1.Assignment2_2241019588;
import java.util.Scanner;

public class Question8
{
    public static void main(String[] args)
    {
        Scanner obj=new Scanner(System.in);
        System.out.println("Enter the size of the array");
        int n=obj.nextInt();
        int[] arr=new int [n]; //Creating an array of n size
        System.out.println("enter the numbers in the array");
        for (int i = 0; i < n; i++)
            arr[i]=obj.nextInt();
        System.out.println("The Smallest missing positive no. is
"+Missing(arr,1));
    }
    public static int Missing(int[] a,int x)
    {
        if(!search(a,0,a.length-1,x))
            return x;
        if(x==a.length)
            return x+1;
        return Missing(a, x+1);
    }
    public static boolean search(int[] arr,int l,int r,int x)
    {
        if (r < l)
            return false;
        if (arr[l] == x)
            return true;
        if (arr[r] == x)
            return true;
        return search(arr,l+1,r-1,x);
    }
}

/* * pseudocode :
* Make an array of size n
* Take Input in the array
* search from 1 in the array in a Missing function
* make a boolean search() for searching the number in the array
*/
```

**OUTPUT:**

```
Enter the size of the array
5
enter the numbers in the array
1
2
4
5
6
The Smallest missing positive no. is 3
PS D:\3rd SEM\AD1\Assignment2_2241019588>
```