**DSA LAB:03**

**Roll No:21sw062**

**Section: 02**

**TASK NO:01**

Implement linear search on 1D and 2D array

.Note: create methods for both 1D and 2D linear search

//LinearSearch1D(int[] A,int key)

//LinearSearch2D(int[][] A, int key)

//call methods and show the search result

import java.util.Arrays;  
  
public class LAB\_3 {  
 public int linear1D(int array[], int key){  
 for (int i=0;i<array.length;i++) {  
 System.*out*.print( array[i]+" ");  
 }  
 System.*out*.println();  
 for (int i=0;i<array.length;i++){  
 if (array[i]==key){  
 return i;  
 }  
 }  
 return -1;  
 }  
  
  
  
  
  
 public int[] linear2D(int[][] array, int key){  
 for (int i=0;i<array.length;i++){  
 for (int j=0;j<3;j++){  
 System.*out*.print(" "+array[i][j]+" ");  
 }  
 System.*out*.println();}  
  
  
 for (int i=0;i<3;i++){  
 for (int j=0;j<3;j++){  
 if (array[i][j]==key){  
 return new int[]{i,j};  
 }}}  
 return new int[]{-1,-1};  
 }}}  
  
public class Main {  
 static int[] *array1* ={2,33,44,11,13,45};  
 static int *array2*[][]={{1,2,3},{11,22,33},{100,101,102}};  
 static int[][] *array22* ={{12,2,23},{111,22,33},{100,101,102}};  
 public static void main(String[] args) {  
 LAB\_3 obj=new LAB\_3();  
 System.*out*.println();  
 System.*out*.println( obj.linear1D(*array1*,33));  
  
  
 System.*out*.println("\n");  
 System.*out*.println(Arrays.*toString*(obj.linear2D(*array22*,33)));  
 System.*out*.println("\n");

}}

**OUTPUT:**

"C:\Program Files\Java\jdk-17.0.2\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2022.1\lib\idea\_rt.jar=60325:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2022.1\bin" -Dfile.encoding=UTF-8 -classpath C:\Users\hp\IdeaProjects\DSA\_LABS\out\production\DSA\_LABS Main  
  
 2 33 44 11 13 45  
 1  
  
  
 12 2 23  
 111 22 33  
 100 101 102  
 [1, 2]  
  
  
 sorted array  
 2 11 13 33 44 45  
 4

**TASK No:2**

Implement binarysearch on 1D and 2D array.

Note: create methods for both 1D and 2D binarysearch

//BinarySearch1D(int[] A,int key, int first, int end)

//BinarySearch2D(int[][] A,int key,int first, int end)

//call methods and show the search result.

import java.util.Arrays;  
  
public class LAB\_3 {

public int binary1D(int array[],int key){  
 Arrays.*sort*(array);  
 System.*out*.println("sorted array");  
 for (int i=0;i<array.length;i++){  
 System.*out*.print(array[i]+" ");  
 }  
 System.*out*.println();  
 // Binary Searching  
 int start=0;  
 int end=array.length-1;  
 int mid;  
 while (start<=end) {  
 int middle =(start + end) / 2;  
 if (array[middle] == key) {  
 return middle;  
  
 }  
 if (array[middle] > key) {  
 end = middle - 1;  
  
 } else {  
 start = middle + 1;  
 }} return -1;  
  
}  
  
public int binary2D(int[][] array, int key) {  
 int[] a = new int[9];  
 int k = 0;  
 for (int i = 0; i < 3; i++) {  
 for (int j = 0; j < 3; j++) {  
 a[k] = array[i][j];  
 k++;  
 }  
 }  
 Arrays.*sort*(a);  
 System.*out*.println("sorted array: ");  
 for (int i = 0; i < 9; i++) {  
 System.*out*.print(a[i] + " ");  
 }  
 System.*out*.println();  
 int start = 0;  
 int end = array.length - 1;  
  
 while (start <= end) {  
 int middle = (start + end) / 2;  
 if (a[middle] == key) {  
 return middle;  
  
 }  
 if (a[middle] > key) {  
 end = middle - 1;  
  
 } else {  
 start = middle + 1;  
 }  
 }  
 return -1;  
}  
}}

public class Main {  
 static int[] *array1* ={2,33,44,11,13,45};  
 static int *array2*[][]={{1,2,3},{11,22,33},{100,101,102}};  
 static int[][] *array22* ={{12,2,23},{111,22,33},{100,101,102}};  
 public static void main(String[] args) {  
 LAB\_3 obj=new LAB\_3();

System.*out*.println(obj.binary1D(*array1*,44));  
System.*out*.println("\n");  
System.*out*.println(obj.binary2D(*array22*,22));

}}

**OUTPUT:**

"C:\Program Files\Java\jdk-17.0.2\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2022.1\lib\idea\_rt.jar=60325:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2022.1\bin" -Dfile.encoding=UTF-8 -classpath C:\Users\hp\IdeaProjects\DSA\_LABS\out\production\DSA\_LABS Main

sorted array:  
 2 12 22 23 33 100 101 102 111  
 2  
  
 2 11 13 33 44 45  
 3

**TASK NO:03**

Display the execution time of searching algo (linear and binary both) and examine which one is the faster and explain why?

longbefore1=System.currentTimeMillis();//call method here longafter1=System.currentTimeMillis();//than fine difference between after and before variable –it will give you the execution time of method

Sample Output:Time took by Linear Search : \_\_\_\_ (time in millisecondsor nanoseconds)

Time took by Binary Search : \_\_\_\_ (time in millisecondsor nanoseconds).

import java.util.Arrays;  
  
public class LAB\_3 {

public void timeCheck(){  
  
LAB\_3 obj =new LAB\_3();  
 long before= (System.*nanoTime*());  
 System.*out*.println( obj.linear1D(Main.*array1*,33));  
 long after= System.*nanoTime*();  
  
  
  
 System.*out*.println("Time of 1DLinear: "+ (after-before) );  
  
 long before1= System.*nanoTime*();  
 System.*out*.println(obj.binary1D(Main.*array1*,44));  
 long after1=System.*nanoTime*();  
  
 System.*out*.println("Time of 1DBinary: "+ (after1-before) );  
}  
  
  
  
}

public class Main {  
 static int[] *array1* ={2,33,44,11,13,45};  
 static int *array2*[][]={{1,2,3},{11,22,33},{100,101,102}};  
 static int[][] *array22* ={{12,2,23},{111,22,33},{100,101,102}};  
 public static void main(String[] args) {  
 LAB\_3 obj=new LAB\_3();

System.*out*.println();  
 obj.timeCheck();  
  
  
}}

**OUTPUT:**

"C:\Program Files\Java\jdk-17.0.2\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2022.1\lib\idea\_rt.jar=60325:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2022.1\bin" -Dfile.encoding=UTF-8 -classpath C:\Users\hp\IdeaProjects\DSA\_LABS\out\production\DSA\_LABS Main

Time of 1DLinear: 397300  
 sorted array

2 11 13 33 44 45  
 4  
 Time of 1DBinary: 10626000  
  
 Process finished with exit code 0