# Lab Task 5: CGF

## 5.1. Select one algorithm.

Binary Search Algorithm.

## 5.2. Code of Algorithm.

```
import  java.util.Scanner;
import java.util.Arrays;
public class BinarySearch{
   public static void main(String args[]){
      int[] arr = {64, 34, 25, 12, 22, 11, 90};
      int[] newarr = sortArr(arr);
      printArr(newarr);
      Scanner input=new Scanner(System.in);
      System.out.println("Enter key to search.");
      int key=input.nextInt();
      binarySearch(newarr,key);
   }
   public static int[] sortArr(int[] arr) {
      Arrays.sort(arr);
      return arr;
   }
   public static void printArr(int[] arr) {
      for (int num : arr) {
         System.out.print(num + " ");
      }
      System.out.println();
   }
```

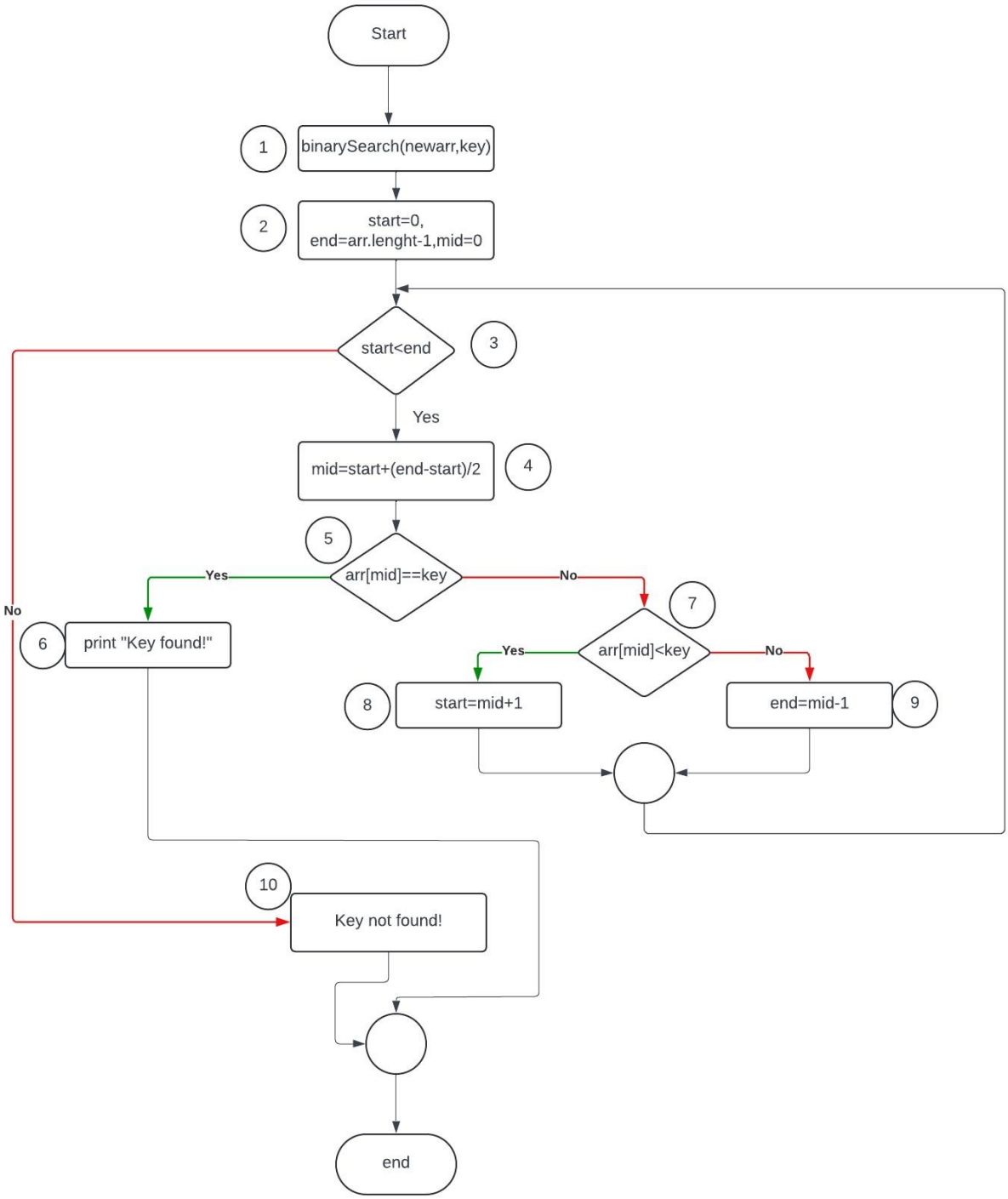
```
    public static void binarySearch(int[] arr, int key){
        int start=0;
        int end=arr.length-1;
        int mid =0;
        while(start<end){
            mid=start+(end-start)/2;

            if(arr[mid]==key){
                System.out.println("Key Found!");
                return ;
            }
            else if(arr[mid]<key){
                start=mid+1;
            }
            else {
                end=mid-1;
            }

        }
        System.out.println("Key not found in array");

    }
}
```

## 5.3. Control Flow Graph.



## 5.4. Paths in CGF

1. 1-2-3-4-5-6
2. 1-2-3-4-5-7-8-3-4-5-6
3. 1-2-3-4-5-7-9-3-4-5-6
4. 1-2-3-4-5-7-8-10
5. 1-2-3-4-5-7-9-10

## 5.5. Test data for each path.

| Paths | Test Data |
|---|---|
| Path 1 | Array= [11, 12, 22, 25, 34, 64, 90], key =25 |
| Path 2 | Array= [11, 12, 22, 25, 34, 64, 90], key=64 |
| Path 3 | Array= [11, 12, 22, 25, 34, 64, 90], key=12 |
| Path 4 | Array= [11, 12, 22, 25, 34, 64, 90], key=80 |
| Path 5 | Array= [11, 12, 22, 25, 34, 64, 90], key=13 |

## 5.6. Test Cases for each path.

| Test ID | Description | Input data | Expected Outcome | Actual Outcome | Status |
|---|---|---|---|---|---|
| **TC_01** | To find an integer in an array that exits in middle of the array after sorting | Array= [11, 12, 22, 25, 34, 64, 90], key =25 | "Key found" message should be displayed. | | |
| **TC_02** | To find an integer in an array that is greater than the middle element of given array | Array= [11, 12, 22, 25, 34, 64, 90], key=64 | "Key found" message should be displayed. | | |
| **TC_03** | To find an integer in an array that is smaller than the middle element of given array | Array= [11, 12, 22, 25, 34, 64, 90], key=12 | "Key found" message should be displayed. | | |
| **TC_04** | Validates the behavior when searching for an integer | Array= [11, 12, 22, 25, 34, 64, 90], key=80 | "Key not found" message should be displayed. | | |

| | | | | | |
|---|---|---|---|---|---|
| | that is greater than the middle element but does not exist in the array. | | | | |
| **TC_05** | Validates the behavior when searching for an integer that is smaller than the middle element but does not exist in the array. | Array= [11, 12, 22, 25, 34, 64, 90], key=13 | "Key not found" message should be displayed. | | |

## 5.7. Code execution results according to test cases.

### 5.7.1. TC_01:

```
11 12 22 25 34 64 90
Enter key to search.
25
Key Found!
```

### 5.7.2. TC_02:

```
11 12 22 25 34 64 90
Enter key to search.
64
Key Found!
```

### 5.7.3. TC_03:

```
11 12 22 25 34 64 90
Enter key to search.
12
Key Found!
```

### 5.7.4. TC_04:

```
11 12 22 25 34 64 90
Enter key to search.
80
Key not found in array
```

### 5.7.5. TC_05:

```
11 12 22 25 34 64 90
Enter key to search.
13
Key not found in array
```