Solve using loop approach and also binary search approach.

Q1.WAP for binary search using recursion as well as while loop approach.

Q2.
Given a sorted array of size N and an integer K, find the position(0-based indexing) at which K is present in the array using binary search.

Example 1:

Input:
N = 5
arr[] = {1 2 3 4 5}
K = 4
Output: 3
Explanation: 4 appears at index 3.

Q 3. First Occurrence of an Element
Modify the binary search function to find the first occurrence of a given element in a sorted array. Return -1 if the element is not present.

For example, given the input array arr = [2, 4, 4, 4, 6, 7, 8] and the target element 4, the function should return 1, as 4 first appears at index 1 in the array.

Q 4. Last Occurrence of an Element
modify the binary search function to find the last occurrence of a given element in a sorted array.

For instance, given the input array arr = [2, 4, 4, 4, 6, 7, 8] and the target element 4, the function should return 3, as 4 last appears at index 3 in the array.

Q 5.
Implement binary search to find the element closest to a given target in a sorted array.

For example, given the input array arr = [1, 2, 4, 7, 9] and the target element 6, the function should return 7, as 7 is the closest element to 6 in the array.

Q 6.
Modify the binary search to find a peak element in a given array.
For example, in the array [1, 3, 20, 4, 1, 0], 20 is a peak element because it is greater than its neighbors 3 and 4.

Q 7.
Given a sorted binary array consisting of only 0s and 1s, write a program to count the number of 1s in the array using binary search.

For example, given the input array arr = [0, 0, 1, 1, 1, 1, 1], the function should return 5 as there are five occurrences of the digit 1 in the array.

Q 8.
Write a program to find the index where a given target element should be inserted in a sorted array to maintain the array's sorted order.

For example, given the input array sortedArray = [1, 3, 5, 6] and the target element 5, the function should return 2, as 5 is already present at index 2. If the target element is 2, the function should return 1, as inserting 2 at index 1 would maintain the sorted order.

Q 9.
You are given a 2D matrix where each row and each column is sorted in ascending order. Write a program to search in a matrix to determine if a target element is present in the matrix.

[
 [1, 4, 7, 11],
 [2, 5, 8, 12],
 [3, 6, 9, 16],
 [10, 13, 14, 17]
]

target element 5, the function should return true, as 5 is present in the matrix.

Q 10.
Given a sorted array of integers, find the starting and ending position of a given target value.

Write a program to find the range of the target element in the array.

For example, given the array [5, 7, 7, 8, 8, 10] and the target element 8, the function should return [3, 4], as 8 appears at positions 3 and 4 in the array.