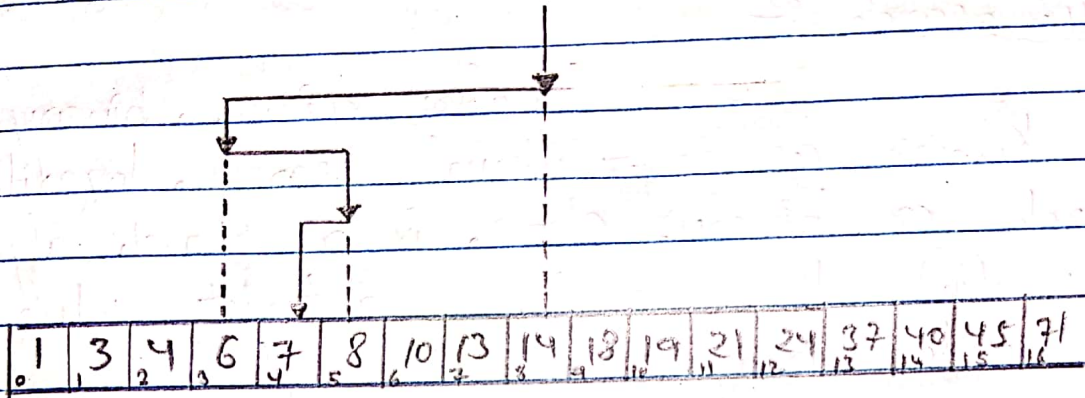


Q2Ans → Binary Search :-

In computer science, binary search, also known as half-interval search, logarithmic search or binary chop, is a search algorithm that finds the position of a target value within a sorted array.

- Binary search compares the target value to the middle element of the array. If they are not equal, the half in which the target cannot lie is eliminated & the search continues on the remaining half, again taking the middle element of the array to compare to the target value, & repeating this until the target value is found.
- If the search ends with the remaining half being empty, the target is not in the array.
- Binary search runs in logarithmic time in the worst case, making $O(\log n)$ comparisons, where
 - 'n' → is the number of elements in the array,
 - O → is Big O notation,
 - \log → is the logarithm.

Binary Search Algorithm



Visualization of the Binary Search Algorithm
 where 7 is the target value.

Class	Search algorithm
Data Structure	Array
Worst - case Performance	$O(\log n)$
Best - case Performance	$O(1)$
Average Performance	$O(\log n)$
Worst - case Space Complexity	$O(1)$

- "Binary search" is faster than "linear search" except for small arrays.
- However, the array must be sorted first to be able to apply binary search. These are specialized "data structures" designed for fast searching, such as "hash tables," that can be searched more efficiently than binary search.
- However, binary search can be used to solve a wider range of problems, such as finding the next-smallest or next-largest element in the array relative to the target element in the array relative to the target even if it is absent from the array.
- There are numerous variations of binary search.
- In particular, "fractional cascading" speeds up binary searches for the same value in multiple arrays.
- Fractional cascading speeds up binary search & efficiently solves a no. of search problems in "computational geometry" & the numerous other fields.

- The "Binary Search" tree & "B-Tree" data structures are based on binary search.