LIST

List

It is a variable-length, linear collection of homogeneous components.

Linear List

It is a list structure in which each element, except the last, has a unique successor.

Two Categories of Linear Lists

- General List
  - Unordered or Random
  - Ordered
- Restricted List
  - FIFO (queue)
  - LIFO (stack)

4 operations associated with linear lists

- Traversal
- Retrieval
- Insertion
- Deletion

Searching

The process that examines a list to locate one or more elements containing a designated value known as a search argument.

Search Argument

The key value being looked for in a search.

Two basic searching methods for arrays

- Sequential Search
- Binary Search

Sequential Search

A search technique used with a linear list in which the searching begins at the first element and continues until the value of an element equal to the value being sought is located. This technique is generally used for small lists and lists which are not sorted.

Binary Search

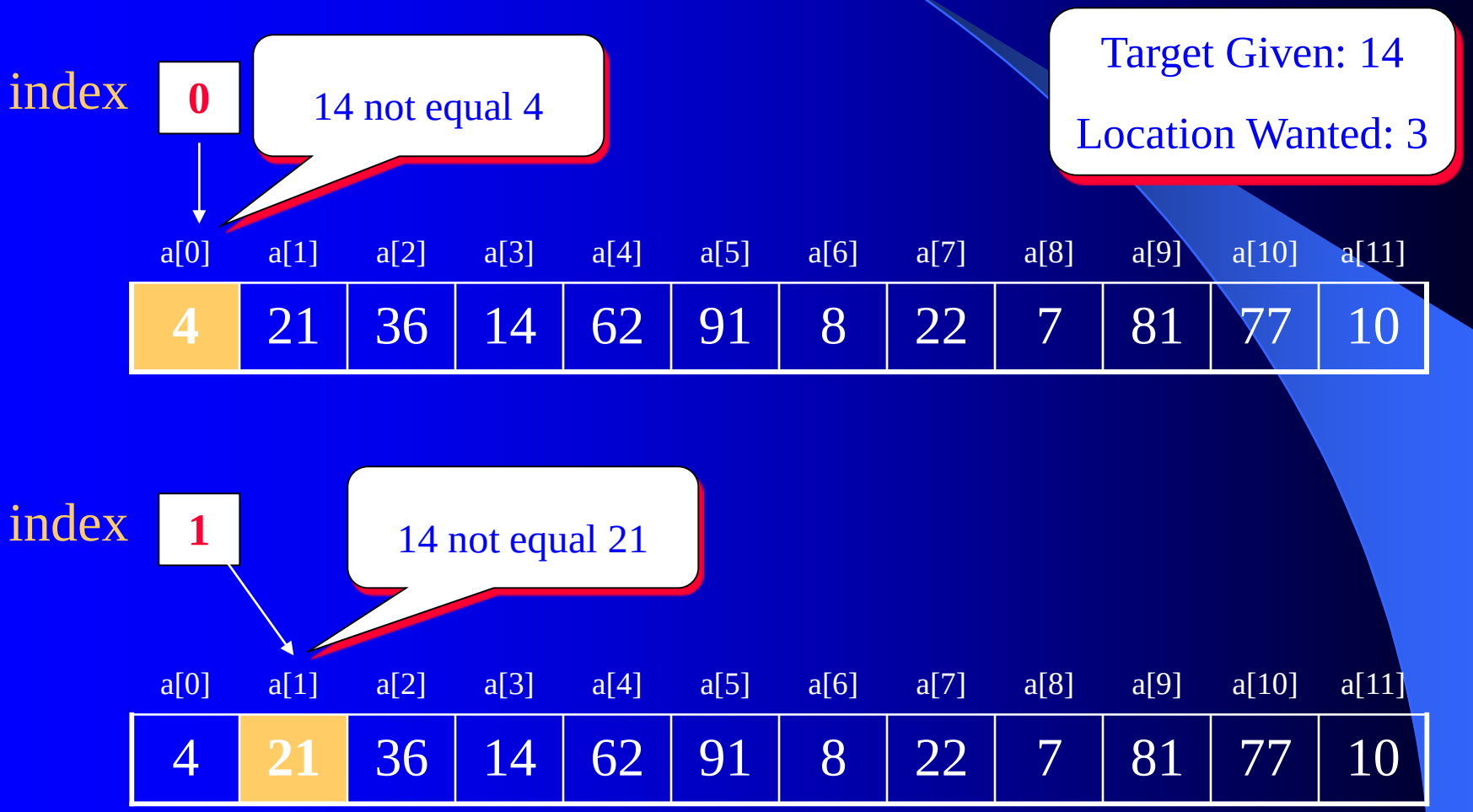
A search algorithm in which the search value is located by repeatedly dividing the list in half. This requires an ordered/sorted list.

Comparison of Binary & Sequential Searches

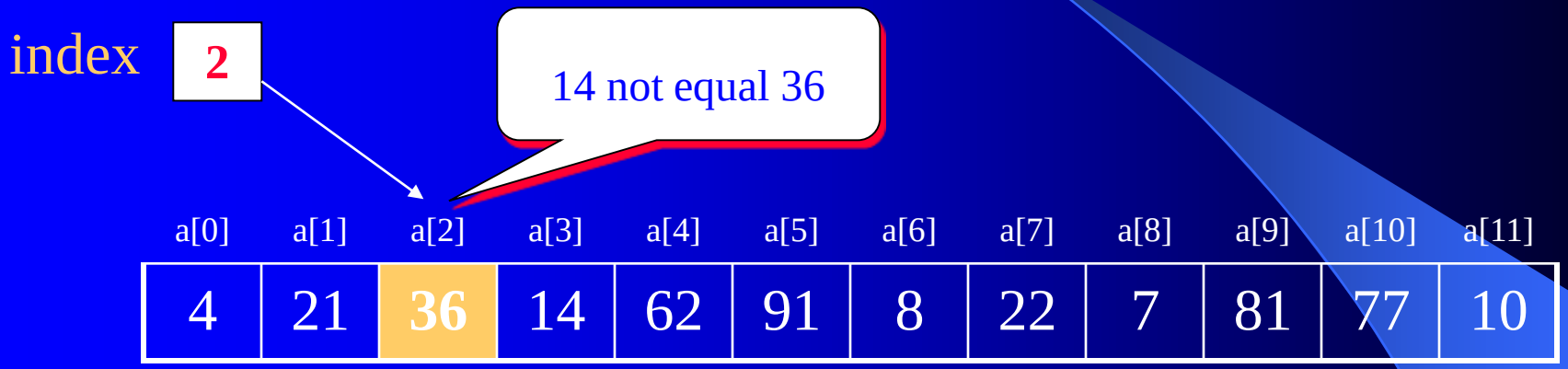
Size	Binary	Sequential (average)	Sequential (worst case)
16	4	8	16
50	6	25	50
256	8	128	256
1,000	10	500	1,000
10,000	14	5,000	10,000
100,000	17	50,000	100,000
1,000,000	20	500,000	1,000,000

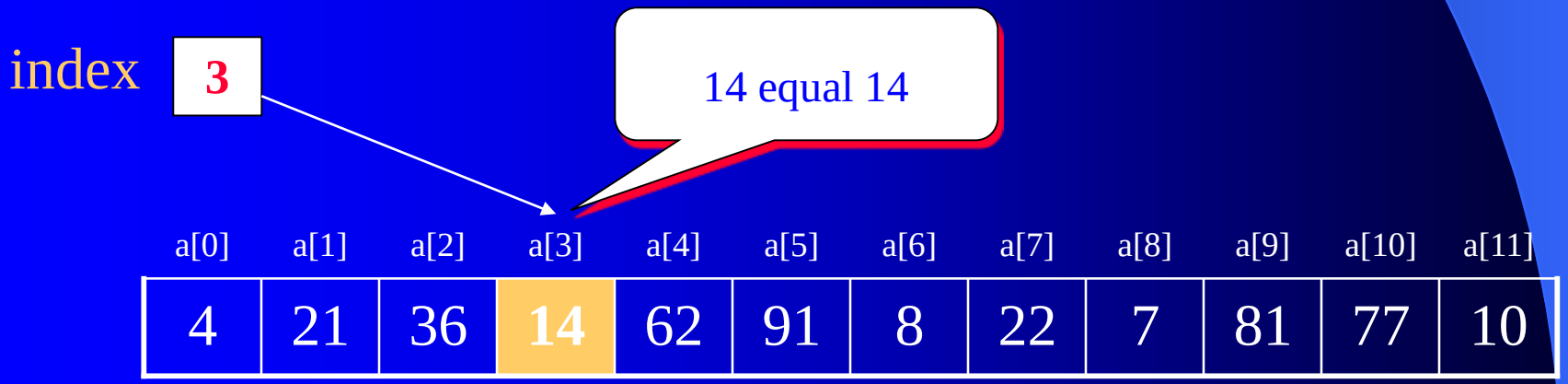
Sequential Search Concept

Locating data in an unordered list

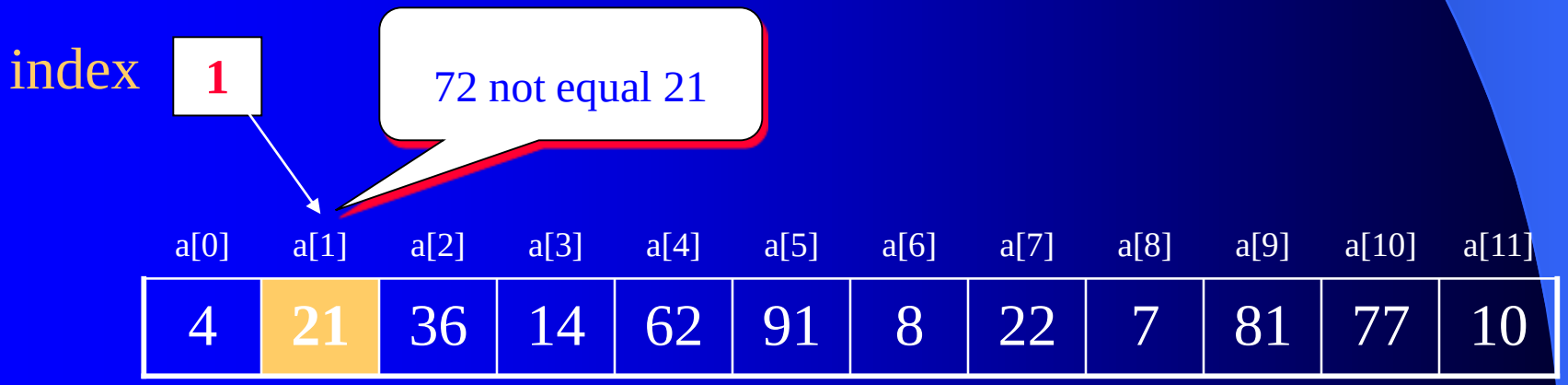


Locating data in an unordered list (cont'd)

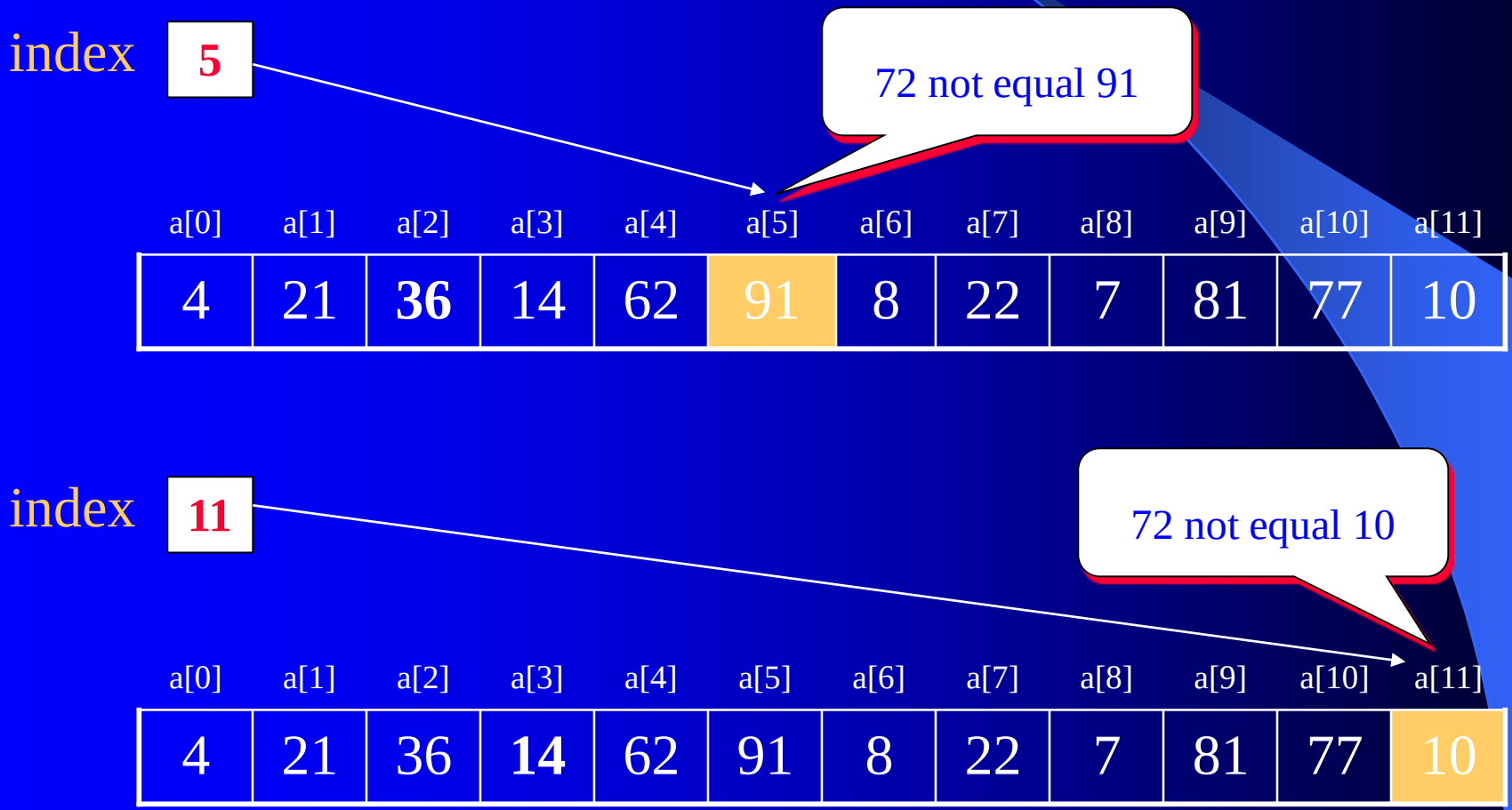




Unsuccessful search in an unordered list



Unsuccessful search in an unordered list (cont'd)



Note: Not all test points are shown

Problem

Write a program that sequentially searches a no. and outputs its physical position in the list. If that no. is not found, display an appropriate message. The program should allow the user to input the nos. in the list. Embed the search process in a function & name it SeqSearch.

Sample Output

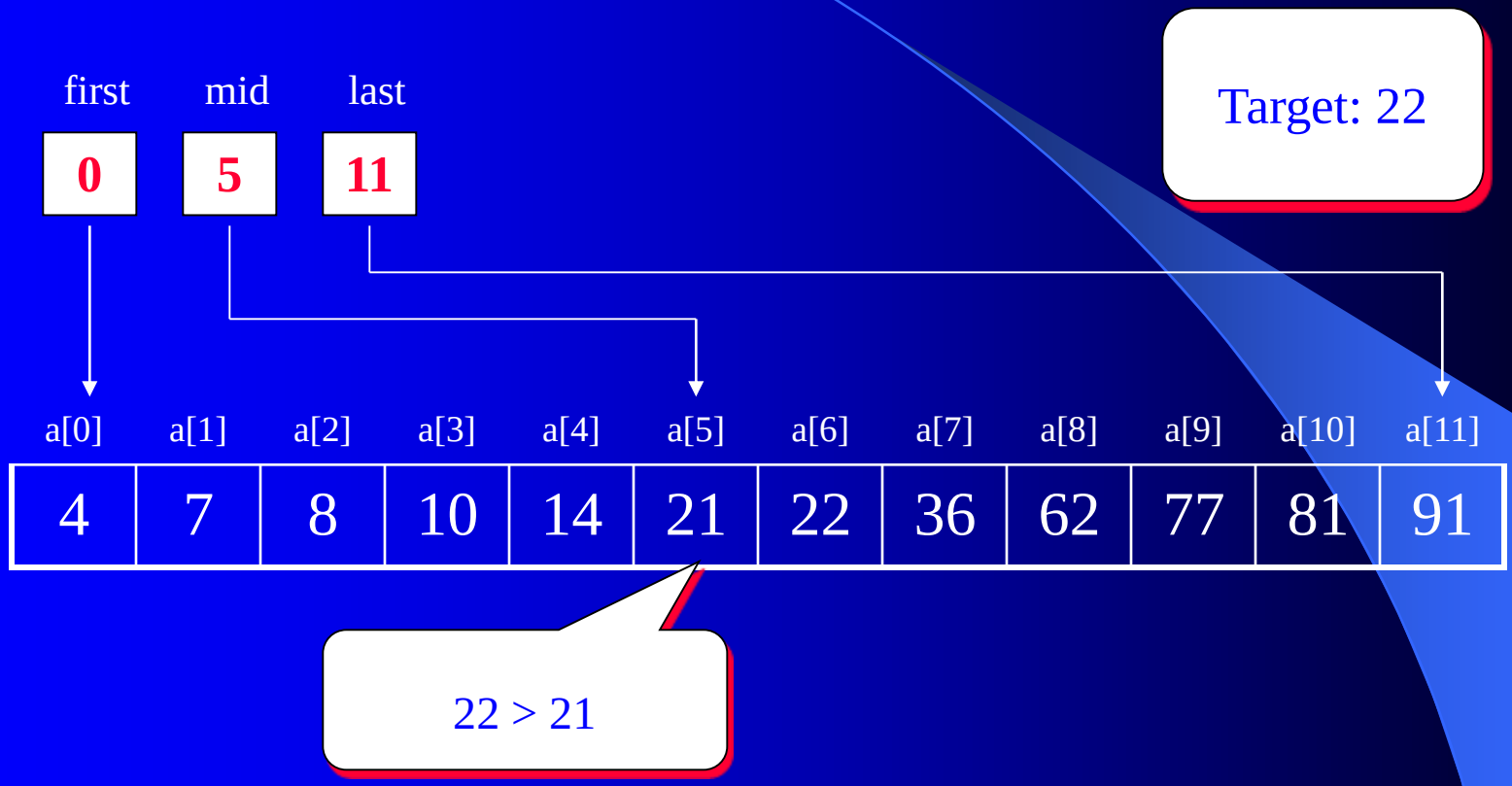
Length of List? 5

Input 5 nos.: 12 75 23 18 56

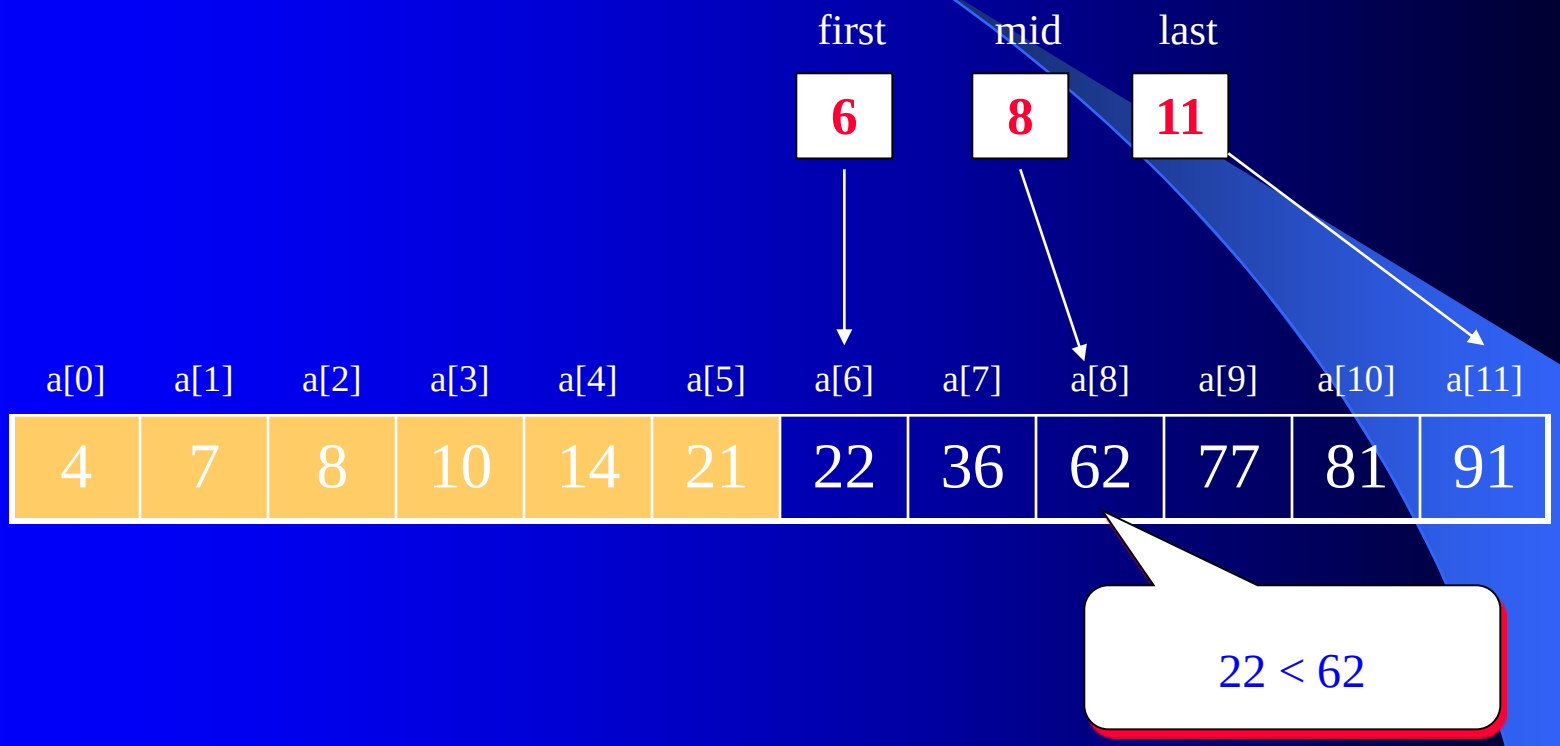
Input a no. to be searched: 23 || 25

The no. is at position 3 || The no. is not in the list

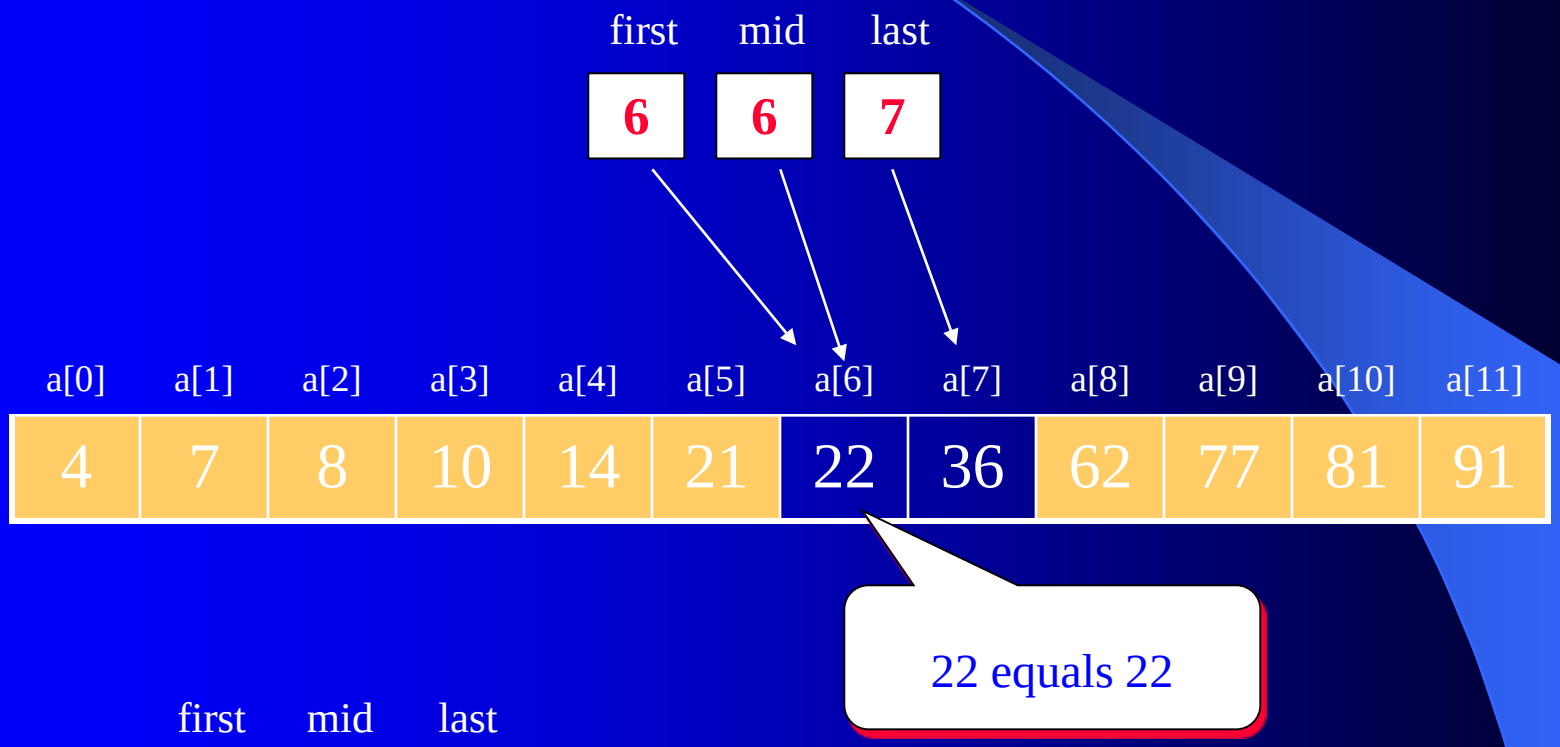
Binary search example



Binary search example (cont'd)

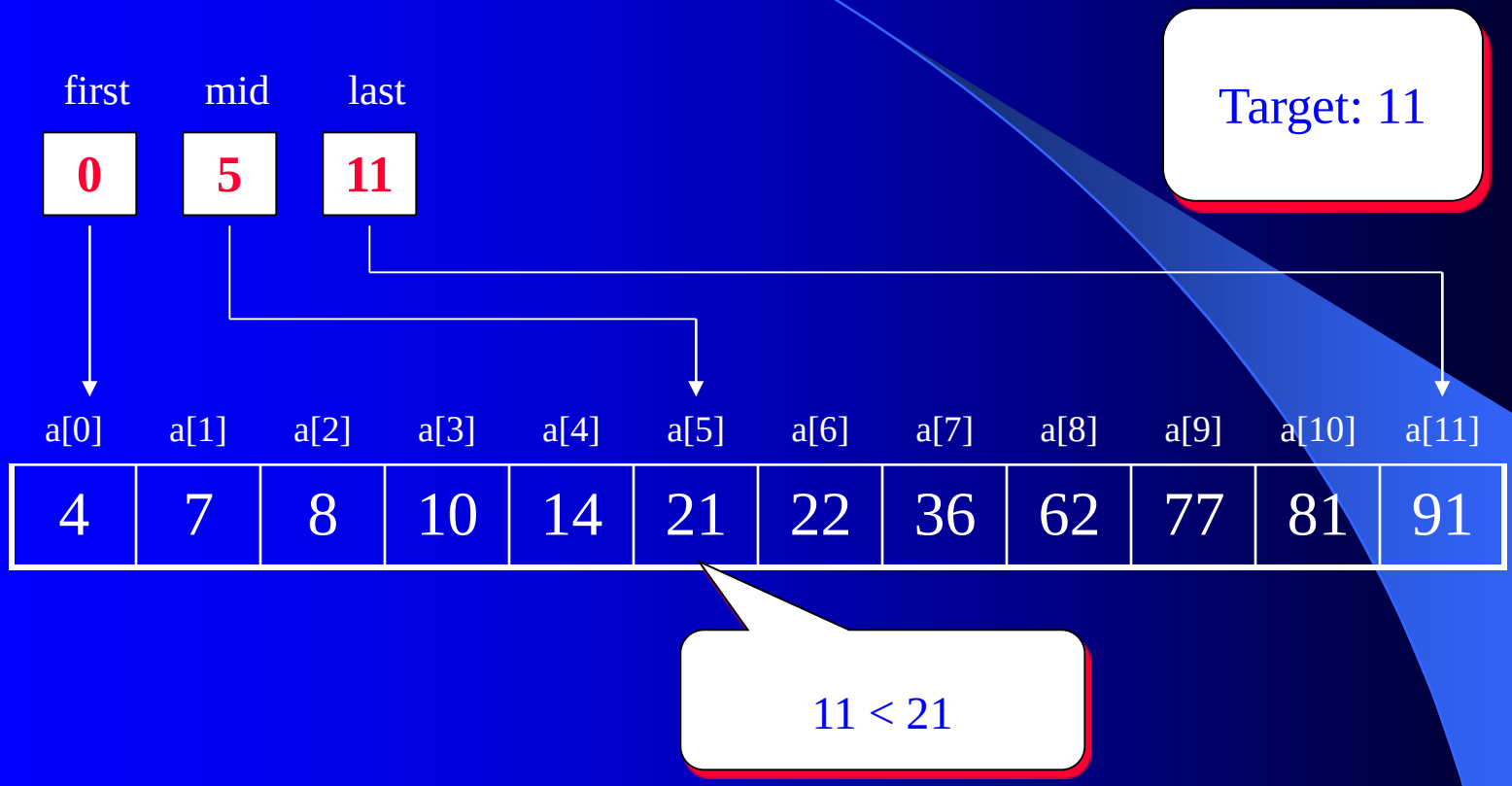


Binary search example (cont'd)

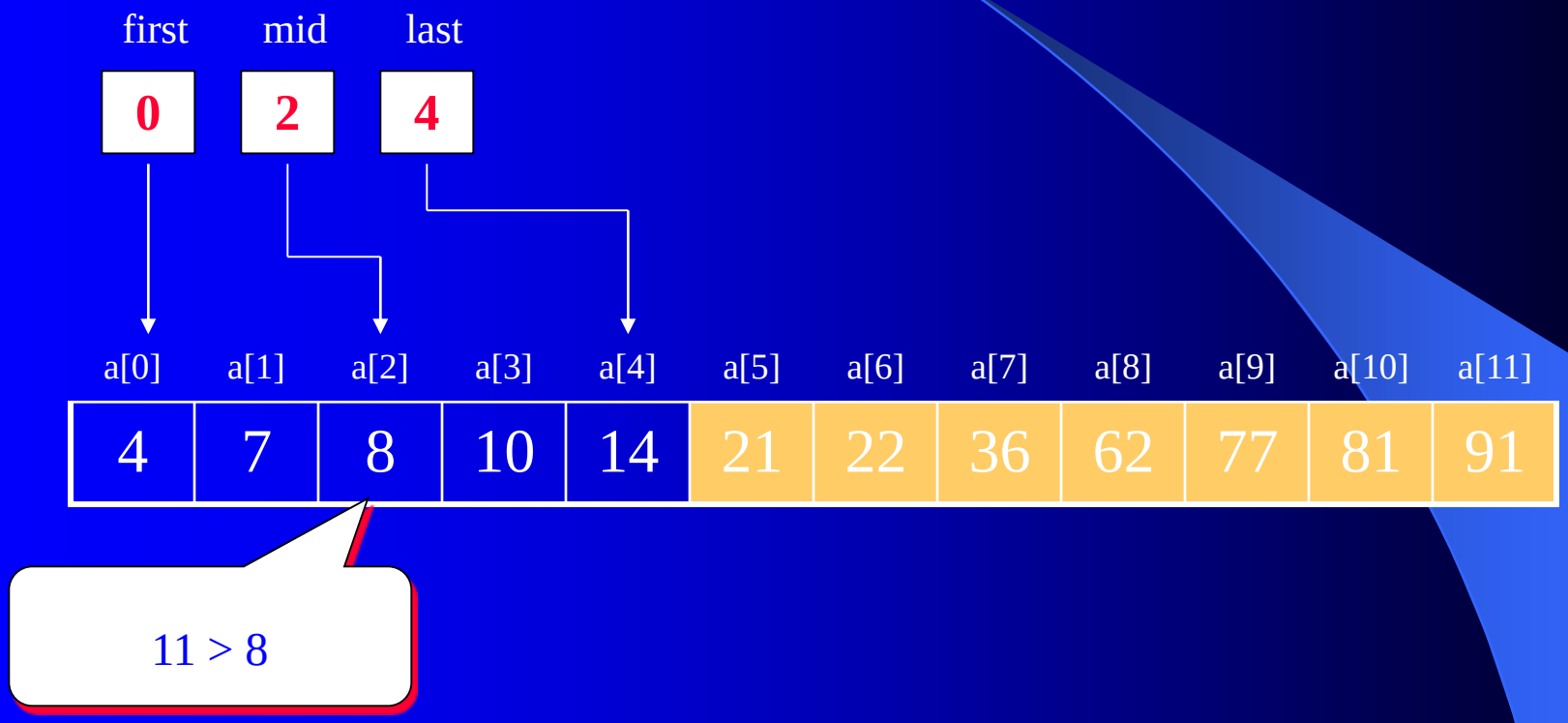


Function terminates

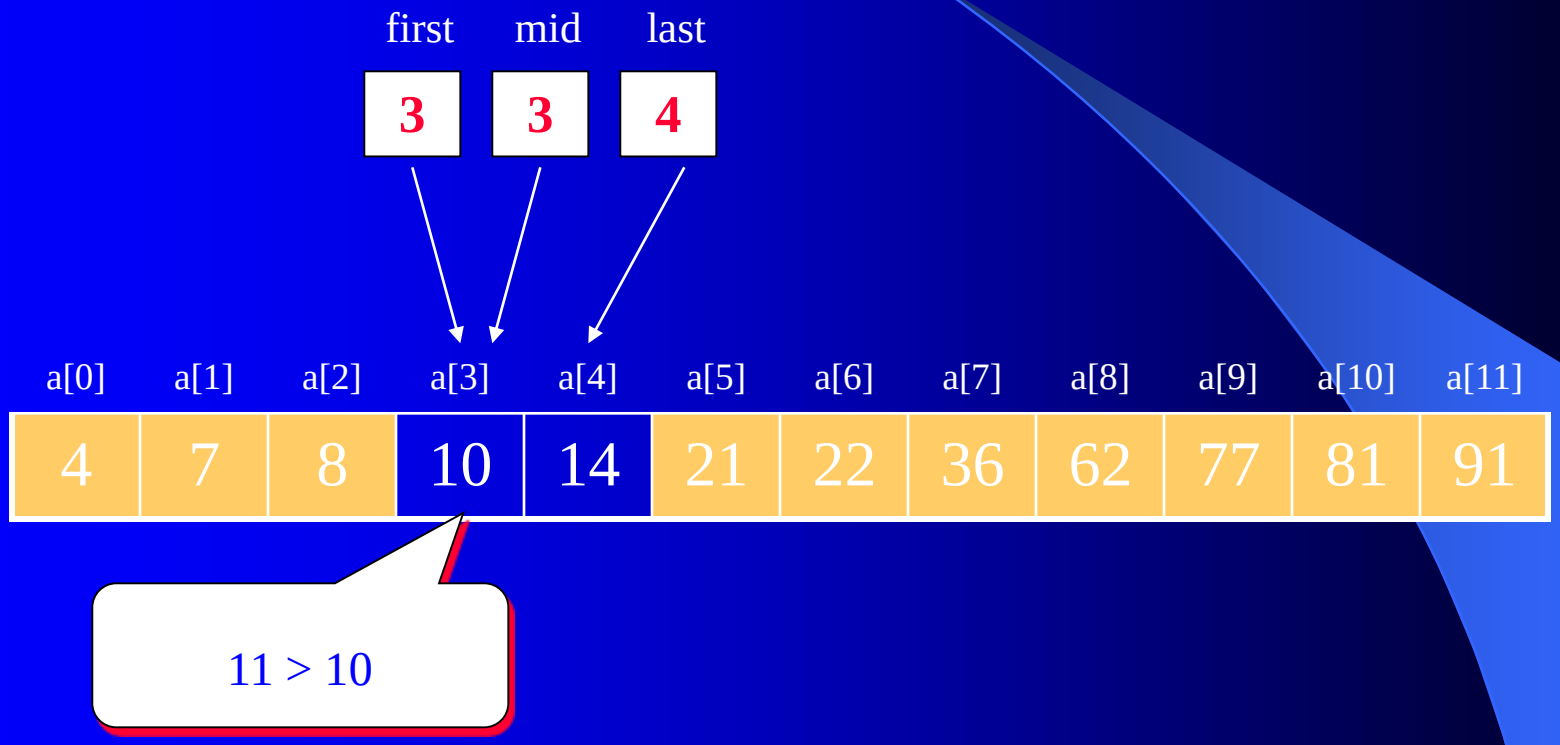
Unsuccessful binary search example



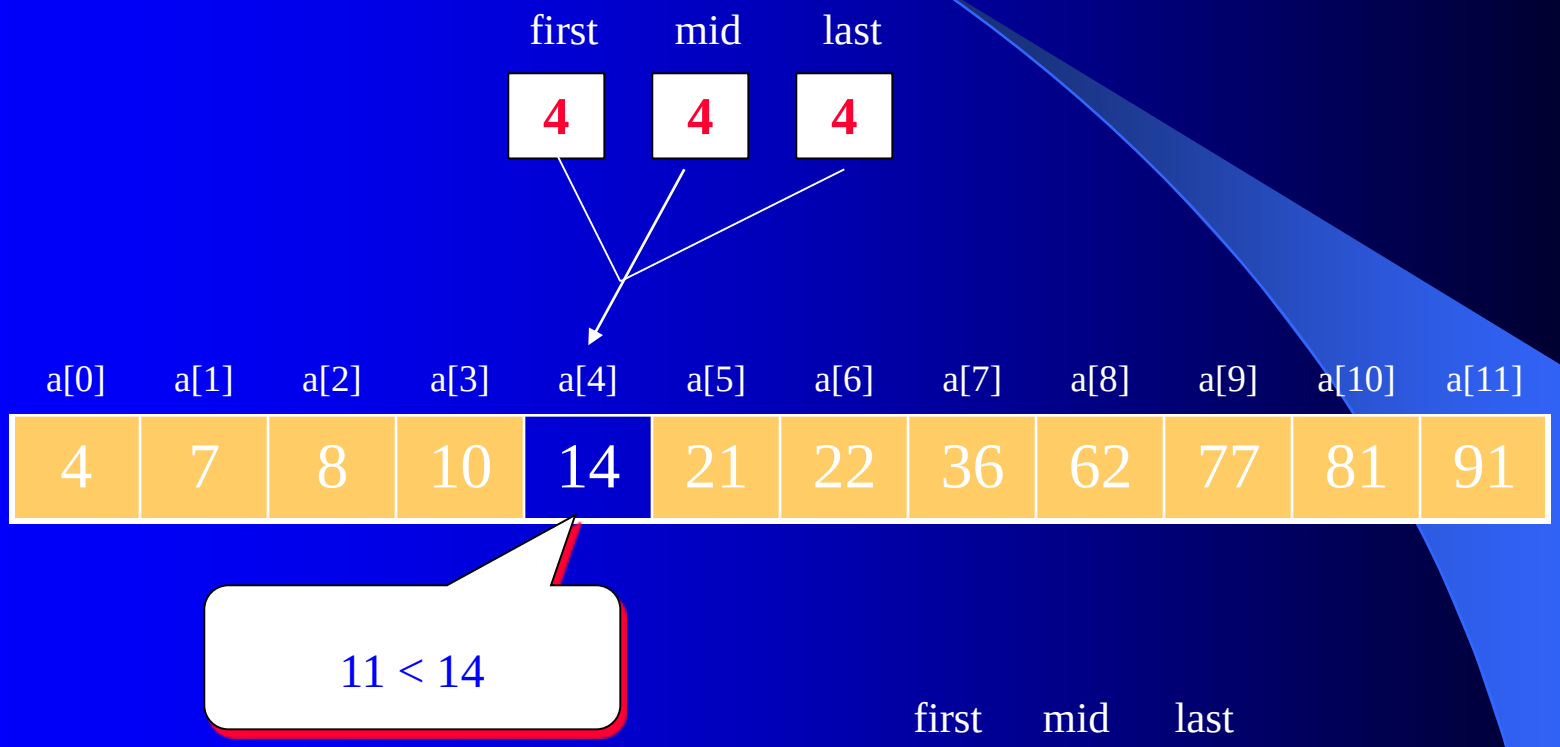
Unsuccessful binary search example (cont'd)



Unsuccessful binary search example (cont'd)



Unsuccessful binary search example (cont'd)



Problem

Write a program that searches a no. (using binary search) and outputs its physical position in the list. If that no. is not found, display an appropriate message. The program should allow the user to input the nos. in the list (in ascending order). Embed the search process in a function & name it BinSearch.

Sample Output

Length of List? 5

Input 5 nos.(ascending order): 12 18 23 56 75

Input a no. to be searched: 56 || 25

The no. is at position 4 || The no. is not in the list