



# Computing Fundamentals using Python

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**SUBJECT CODE : UQ25CA151A**

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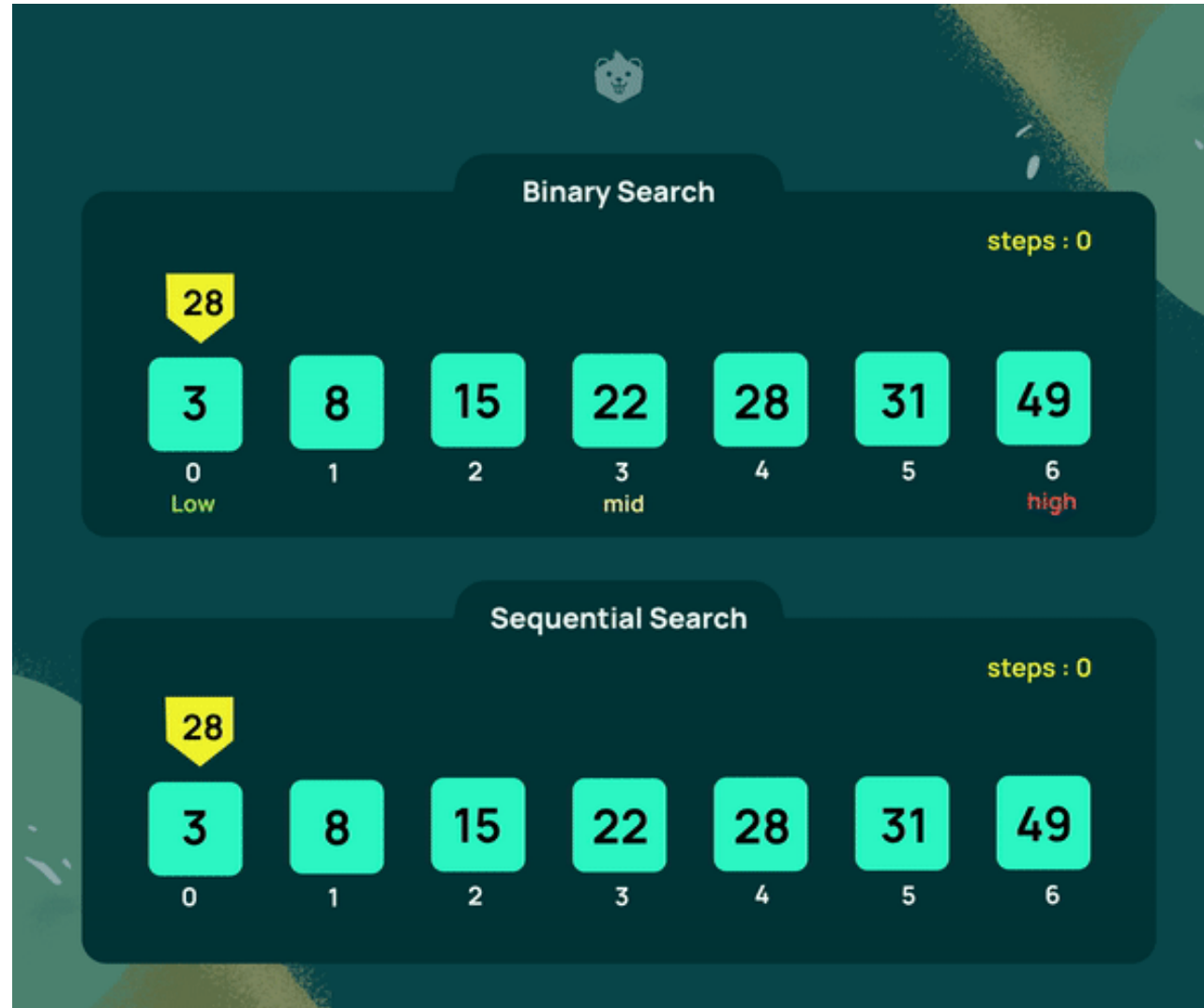
## Binary Search

Binary Search is an efficient searching algorithm that works only on sorted data (ascending or descending).

Instead of checking one by one (like linear search), it repeatedly divides the search space in half until the target is found (or confirmed missing).

## Linear Search

Working of Binary search



## Binary Search Algorithm

### Binary Search Algorithm (Steps)

1. Start with two pointers: **low = 0**, **high = len(list)-1**.
2. Find the **middle index**:  $\text{mid} = (\text{low} + \text{high}) // 2$ .
3. If the middle element is the target  $\rightarrow$  Found.
4. If the target is **smaller**, search the **left half** ( $\text{high} = \text{mid} - 1$ ).
5. If the target is **greater**, search the **right half** ( $\text{low} = \text{mid} + 1$ ).
6. Repeat until found or  $\text{low} > \text{high}$  (not found).

## Program on binary search using list

```
numbers = [10, 20, 30, 40, 50, 60, 70]
target = int(input("Enter number to search: "))
low = 0
high = len(numbers) - 1
found = False
while low <= high:
    mid = (low + high) // 2 # Find middle
    if numbers[mid] == target:
        print(f"{target} found at index {mid}")
        found = True
        break
```

```
elif numbers[mid] < target:
    low = mid + 1 # Search right half
else:
    high = mid - 1 # Search left half

if not found:
    print(f"{target} not found in the list")
```

## MCQ's

Which of the following statements is **true** about Linear Search?

- A) Works only on sorted lists
- B) Time complexity is always  $O(\log n)$
- C) Checks elements sequentially until found or end of list
- D) Cannot be used for strings

**Answer: C**

## MCQ's

Binary Search can only be applied on:

- A) Any list
- B) Sorted list
- C) Strings only
- D) Dictionaries only

**Answer: B**

## MCQ's

If the element to be searched is **not present** in the list of  $n$  elements, how many comparisons will Linear Search make?

- A)  $n/2$
- B)  $n-1$
- C)  $n$
- D) Depends on the element

**Answer: C**



## MCQ's

You want to search a name in a **phone contact list** (already sorted alphabetically). Which search is more efficient?

- A) Linear Search
- B) Binary Search
- C) Both same
- D) None

**Answer: B**

## MCQ's

Which algorithm is better when the list is **very small or unsorted**?

- A) Binary Search
- B) Linear Search
- C) Both equally good
- D) None

**Answer: B**

## Practice program

**Write Python code for the followings.**

1. A railway reservation system has sorted **train numbers**. A passenger enters a train number as input, and the system checks the availability of train. Display the availability of the train.
2. A library maintains a sorted list of **book titles**. A librarian searches whether a particular title is in the system.



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