

Algorithm

Binary Search

Example





Binary Search

Target: "USA"

```
['Brazil', 'Chile', 'India', 'Japan', 'Spain', 'Switzerland', 'USA', 'Uruguay']
```





Binary Search

```
['Brazil', 'Chile', 'India', 'Japan', 'Spain', 'Switzerland', 'USA', 'Uruguay']
```

[0]

[1]

[2]

[3]

[4]

[5]

[6]

[7]



Binary Search

```
['Brazil', 'Chile', 'India', 'Japan', 'Spain', 'Switzerland', 'USA', 'Uruguay']
```

[0]

[1]

[2]

[3]

[4]

[5]

[6]

[7]



Binary Search

"Japan" < "USA"

`['Brazil', 'Chile', 'India', 'Japan', 'Spain', 'Switzerland', 'USA', 'Uruguay']`

[0]

[1]

[2]

[3]

[4]

[5]

[6]

[7]



Binary Search

~~['Brazil', 'Chile', 'India', 'Japan', 'Spain', 'Switzerland', 'USA', 'Uruguay']~~

[0]

[1]

[2]

[3]

[4]

[5]

[6]

[7]



Binary Search

['Brazil', 'Chile', 'India', 'Japan', 'Spain', 'Switzerland', 'USA', 'Uruguay']

[0]

[1]

[2]

[3]

[4]

[5]

[6]

[7]



Binary Search

"Switzerland" < "USA"

['Brazil', 'Chile', 'India', 'Japan', 'Spain', 'Switzerland', 'USA', 'Uruguay']

[0]

[1]

[2]

[3]

[4]

[5]

[6]

[7]



Binary Search

~~['Brazil', 'Chile', 'Indonesia', 'Japan', 'Singapore', 'Switzerland', 'USA', 'Uruguay']~~

[0]

[1]

[2]

[3]

[4]

[5]

[6]

[7]



Binary Search

Found at index 6!

['Brazil', 'Chile', 'Indonesia', 'Japan', 'South Korea', 'Switzerland', 'USA', 'Uruguay']

[0]

[1]

[2]

[3]

[4]

[5]

[6]

[7]

```
['Brazil', 'Chile', 'India', 'Japan', 'Spain', 'Switzerland', 'USA', 'Uruguay']
```

```
def binary_search(data, item):  
    low = 0  
    high = len(data) - 1  
  
    while low <= high:  
        middle = (low + high)//2  
  
        if data[middle] == item:  
            return middle  
        elif data[middle] > item:  
            high = middle - 1  
        else:  
            low = middle + 1  
  
    return -1
```

```
>>> data = ["Brazil", "Chile", "India", "Japan", "Spain", "Switzerland", "USA", "Uruguay"]  
>>> binary_search(data, "USA")  
====> Starting Binary Search  
Initial bounds:  
Lower bound: 0  
Upper bound: 7  
  
=== Iteration #0 ===  
Lower bound: 0  
Upper bound: 7  
Middle index: 3  
We are looking for: USA  
The middle element is: Japan  
Is this the target item? No  
This middle item is smaller than the target item: Japan < USA  
We need to discard the lower half of the list  
Now the new lower bound is: 4  
The upper bound remains at: 7  
  
=== Iteration #1 ===  
Lower bound: 4  
Upper bound: 7  
Middle index: 5  
We are looking for: USA  
The middle element is: Switzerland  
Is this the target item? No  
This middle item is smaller than the target item: Switzerland < USA  
We need to discard the lower half of the list  
Now the new lower bound is: 6  
The upper bound remains at: 7  
  
=== Iteration #2 ===  
Lower bound: 6  
Upper bound: 7  
Middle index: 6  
We are looking for: USA  
The middle element is: USA  
Is this the target item? True  
The item was found at index 6  
6
```

Target String: "USA"



Time to Practice!

