

Sequential Search: (unordered & ordered search)

✓ ✓ ✓

| | | | | | | |
|----|----|----|----|----|---|----|
| 54 | 25 | 73 | 12 | 15 | 2 | 30 |
|----|----|----|----|----|---|----|

→ 54 → 1x Iterasi
→ 30 → 7x Iterasi
→ 0 → 7x Iterasi

✓

| | | | | | | |
|---|----|----|----|----|----|----|
| 2 | 12 | 15 | 25 | 30 | 54 | 73 |
|---|----|----|----|----|----|----|

→ 0 < 2 →
→ 73 → 7x Iterasi
→ 80 → 7x Iterasi

$\frac{2+12+15}{3} = 2$

Binary Search

Iterasi 1

Sorted

First ↓ 0 1 2 3 4 5 6 ↓ last


| | | | | | | |
|---|----|----|----|----|----|----|
| 2 | 12 | 15 | 25 | 30 | 54 | 73 |
|---|----|----|----|----|----|----|

$mid = (first + last) // 2$
 $= (0 + 6) // 2 = 3$

Iterasi 2

Key = 73 → Data[3] = 25

$mid = (first + last) // 2$
 $= (4 + 6) // 2 = 5$
→ Data[5] = 54



1... $mid = (first + last) // 2$
 $= (0 + 6) // 2 = 3$
 Key = 73 \rightarrow Data[3] == 73?



First \downarrow 0 1 2 3 4 5 6 last =

1... $mid = (first + last) // 2$
 $= (0 + 6) // 2 = 3$
 Key = 73 \rightarrow Data[3] == 73?

2... $mid = (first + last) // 2$
 $= (4 + 6) // 2 = 5$
 \rightarrow Data[5] == 73?

3... $mid = (6 + 6) // 2 = 6$
 Data[6] == 73?

Dalam contoh ini, utk mlakukn pcarian 73 maka binary search mbutuhkn 3x iterasi sdgkan pd ordered sequential search mbutuhkn 7x iterasi

Contoh search lainnya (data di sebelah kiri middle atau data tdk ada)

first \downarrow last \downarrow Key = 14

| | | | | | | |
|---|----|----|----|----|----|----|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| 2 | 12 | 15 | 25 | 30 | 54 | 73 |

1. $mid = (first + last) // 2 = (0 + 6) // 2 = 3$

first \downarrow last \downarrow Key = 14

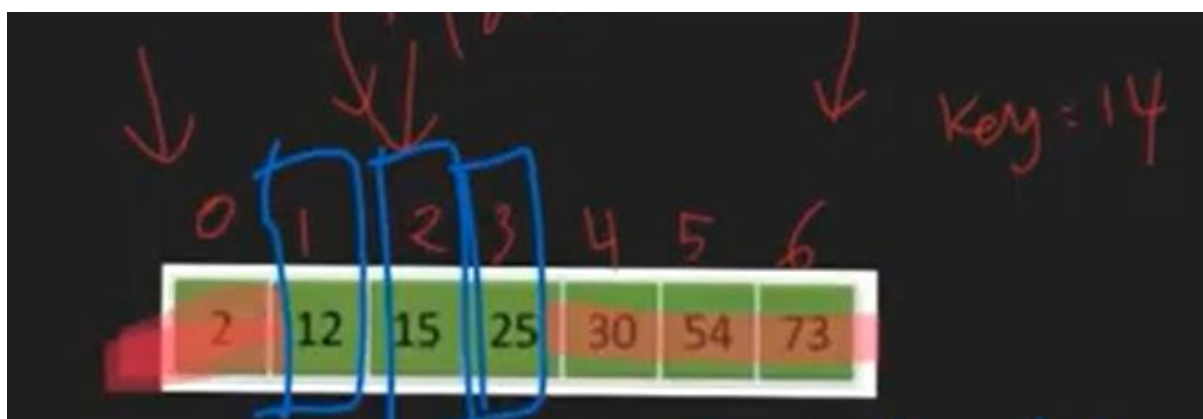
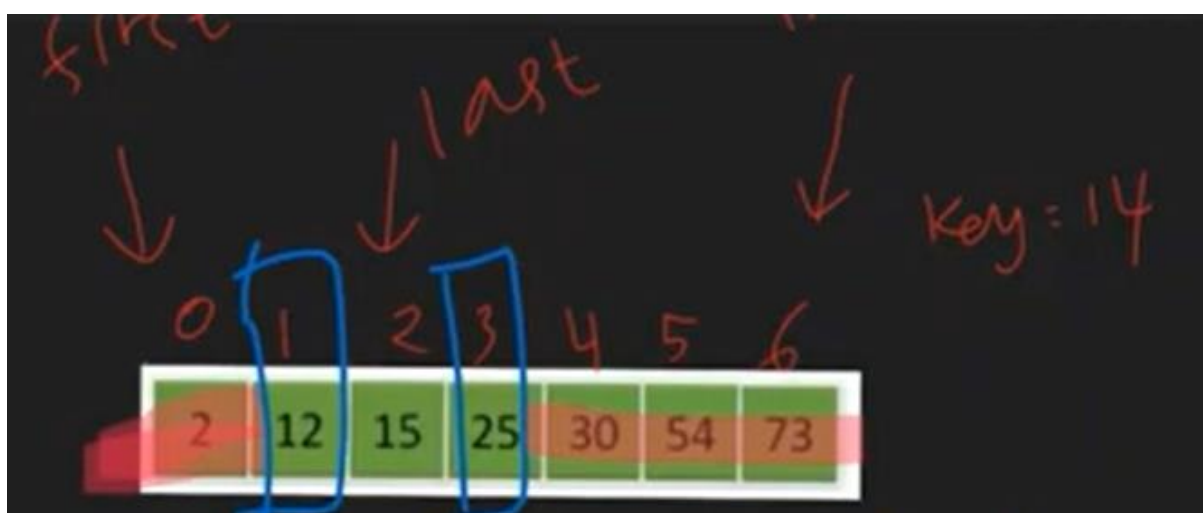
| | | | | | | |
|---|----|----|----|----|----|----|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| 2 | 12 | 15 | 25 | 30 | 54 | 73 |

1. $mid = (first + last) // 2 = (0 + 6) // 2 = 3$

data[3] == key ? \times

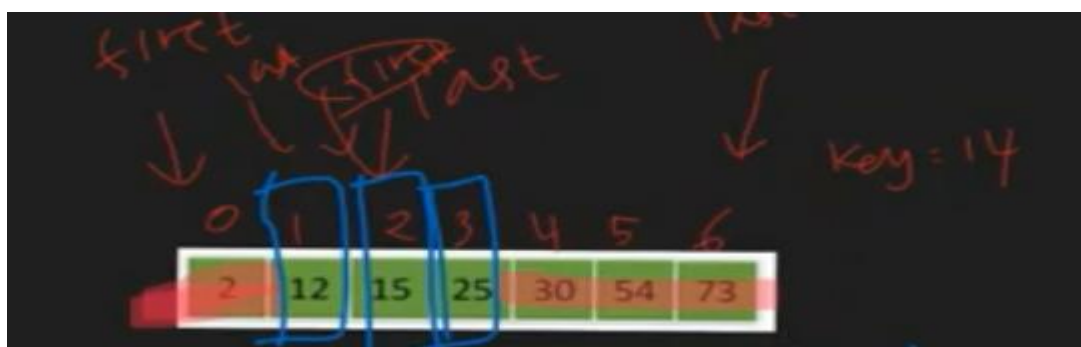
2. $mid = (0 + 2) // 2 = 1$
 $data[1] = key$ ✗

3. $mid = (2 + 2) // 2 = 2$
 $data[2] = key$ ✗
 $15 \neq 14$ ✗



Setting dilakukan jika

$[key] > [mid]$
 $\rightarrow first = mid + 1$
 $[key] < [mid]$
 $\rightarrow last = mid - 1$



Kondisi normal (pencarian dilakukan) & tidak normal (pencarian berhenti)

$first < last$
 $first = last$
 $last < first$
 $first > last$

first \downarrow last \downarrow key = 14

| | | | | | | |
|---|----|----|----|----|----|----|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| 2 | 12 | 15 | 25 | 30 | 54 | 73 |

1. $mid = (first + last) // 2 = (0 + 6) // 2 = 3$
 $data[3] = 25 \neq key ? \times$

2. $mid = (0 + 2) // 2 = 1$
 $data[1] = 12 \neq key ? \times$

3. $mid = (2 + 2) // 2 = 2$
 $data[2] = 15 \neq key ? \times$

Logic:

- $[key] > [mid] \rightarrow first = mid + 1$
- $[key] < [mid] \rightarrow last = mid - 1$

Loop condition: $first < last$
 Update: $first = last$

Binary Search

```
In [ ]: def binSearch(listData, key):
    found = False
    first = 0
    last = len(listData) - 1

    while first <= last and not(found):
        mid = (first + last) // 2
        if listData[mid] == key:
            found = True
            ind = mid
        elif key > listData[mid]:
            first = mid + 1
        elif key < listData[mid]:
            last = mid - 1

    if found:
        return ind
    else:
        return False
```

Binary Search

```
In [8]: def binSearch(listData, key):  
        found=False  
        first=0  
        last=len(listData)-1  
        count=0  
        while first<=last and not(found):  
            mid=(first+last)//2  
            if listData[mid]==key:  
                found=True  
                ind=mid  
            elif key>listData[mid]:  
                first=mid+1  
            elif key<listData[mid]:  
                last=mid-1  
            count+=1  
        print('counter=',count)  
        if found:  
            return ind  
        else:  
            return False
```

```
In [11]: a=[2,12,15,25,30,54,73]  
         binSearch(a,73)
```

counter= 3

Out[11]: 6

```
In [10]: a=[2,12,15,25,30,54,73]  
         binSearch(a,14)
```

counter= 3

Out[10]: False