

## 11.7 Linear Search

### Linear Search Algorithm

- Searches each element in an array sequentially
- If the search key does not match an element in the array, the algorithm informs the user that the search key is not present
- If the search key is in the array, the algorithm tests each element until it finds one that matches the search key and returns the index of that element

### Linear Search Algorithm (cont.)

- Consider

35 73 90 65 23 86 43 81 34 58

- Searching for 86
  - Algorithm first checks whether 35 matches the search key
  - It does not, so the algorithm checks whether 73 matches the search key
  - Continues moving through the array sequentially, testing 90, then 65, then 23
  - When the program tests 86, which matches the search key, the program returns the index 5
  - If, after checking every array element, the program determines that the search key does not match any element in the array, it returns a sentinel value (e.g., -1)

### Linear Search Implementation

- `linear_search` linear searches an array of integers
- Receives the array to search (`data`) and the `search_key`
- The `for` loop iterates through `data`'s elements and compares each with `search_key`
- Returns the index of the matching element or -1

In [1]:

```
def linear_search(data, search_key):  
    for index, value in enumerate(data):  
        if value == search_key:  
            return index  
    return -1
```

In [2]:

```
import numpy as np
```

In [3]:

```
np.random.seed(11)
```

In [4]:

```
values = np.random.randint(10, 91, 10)
```

In [5]:

```
values
```

Out[5]:

```
array([35, 73, 90, 65, 23, 86, 43, 81, 34, 58])
```

In [6]:

```
linear_search(values, 23)
```

Out[6]:

```
4
```

In [7]:

```
linear_search(values, 61)
```

Out[7]:

```
-1
```

In [8]:

```
linear_search(values, 34)
```

Out[8]:

```
8
```

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