

# Exercise walk-through

## Searching Algorithms ■ 4.14

eXercise

## You must be able to

- perform a **linear search** 线性查找 by checking each element in turn
- perform a **binary search** 二分查找 on a **sorted** collection
- explain why binary search requires sorted data

## Method — Linear search

Check each element in turn until a match is found (or the end is reached). It works on **any** list, sorted or not.

## Method — Binary search

On a **sorted** list, look at the middle; if the target is smaller, search the left half, else the right — each step **halves** the range. It is far faster (about  $\log_2 n$  steps), but the data **must be sorted first**.

## Practice 2.1 ■ 1 mark

Describe a linear search.

## Solution 2.1

Method: Linear search

### Worked steps

checking each element one by one until a match is found **B1**.

## Practice 2.2 ■ 1 mark

State the requirement for binary search to work.

## Solution 2.2

Method: Binary search

### Worked steps

the data must be sorted **B1**.



## Practice 2.3 ■ 1 mark

State which search is faster on a large sorted list.

## Solution 2.3

Method: Binary search

### Worked steps

binary search **B1**.

## Exam-style 3.1 ■ 1 mark

A linear search checks

**A** the middle element only

**B** each element in turn

**C** random elements

**D** no elements

## Solution 3.1

Method: Linear search

**A** the middle element only

**B** each element in turn 

**C** random elements

**D** no elements

### Worked steps

**B.**

## Exam-style 3.2 ■ 1 mark

Binary search requires the data to be

**A** reversed

**B** sorted

**C** empty

**D** in random order

## Solution 3.2

Method: Binary search

**A** reversed

**B** sorted



**C** empty

**D** in random order

### Worked steps

**B.**

## Exam-style 3.3 ■ 1 mark

A sorted list has 32 items.

- (a) Name the faster search method.
- (b) State roughly how many steps binary search needs ( $32 \rightarrow 16 \rightarrow 8 \rightarrow 4 \rightarrow 2 \rightarrow 1$ ).
- (c) Name the search that works on unsorted data.

## Solution 3.3

Method: Binary search

### Worked steps

(a) binary search **B1**. (b) about 5 **B1**. (c) linear search **B1**.