

3.11 Binary Search

Name: _____ Class: _____ Date: _____

Total: 8 marks**KEY WORDS** binary search 二分查找 • sorted 已排序 • halves 减半 • list 列表

Objective

Build the skills to answer exam questions on **binary search**.

You must be able to:

- explain how **binary search** 二分查找 locates a target in a **sorted** list
- describe how each comparison **halves** 减半 the remaining portion
- state the requirement that the data must be **sorted** 已排序
- compare binary search with a linear search

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ Binary search

On a **sorted** list, look at the **middle** element. If the target is smaller, search the **left** half; if larger, search the **right** half. Each comparison **halves** the items still to check.

■ Requirement

The list **must be sorted** first, or binary search fails.

■ Versus linear search

A linear search checks each element in turn; binary search is far faster on large sorted lists (about $\log_2 n$ steps instead of n).

2 Practice

2.1 State the requirement a list must meet for binary search to work. [1]

2.2 State what each comparison in a binary search does to the remaining items. [1]

2.3 State one advantage of binary search over linear search.

[1]

3 Exam-style questions

3.1 Binary search requires the list to be

[1]

A	B
C	D

A sorted

B empty

C reversed

D in random order

3.2 Each step of a binary search

[1]

- **A** doubles
- **B** halves
- **C** ignores
- **D** shuffles

the remaining items to search.

3.3 A sorted list has 16 items.

(a) Name the search method that halves the list at each step.

[1]

(b) State roughly how many steps it needs in the worst case ($16 \rightarrow 8 \rightarrow 4 \rightarrow 2 \rightarrow 1$). [1]

(c) State whether binary search works on an **unsorted** list.

[1]