

4.14 Searching Algorithms

Name: _____ Class: _____ Date: _____

Total: 8 marks

KEY WORDS binary search 二分查找 • linear search 线性查找

Objective

Build the skills to answer exam questions on **searching algorithms**.

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

1 Worked examples

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

■ 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.

■ 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**.

2 Practice

2.1 Describe a linear search. [1]

2.2 State the requirement for binary search to work. [1]

2.3 State which search is faster on a large sorted list. [1]

3 Exam-style questions

3.1 A linear search checks [1]

- **A** the middle element only
 - **B** each element in turn
 - **C** random elements
 - **D** no elements
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3.2 Binary search requires the data to be [1]

- **A** reversed
 - **B** sorted
 - **C** empty
 - **D** in random order
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3.3 A sorted list has 32 items.

(a) Name the faster search method. [1]

(b) State roughly how many steps binary search needs ($32 \rightarrow 16 \rightarrow 8 \rightarrow 4 \rightarrow 2 \rightarrow 1$). [1]

(c) Name the search that works on unsorted data. [1]

Solutions

2.1 checking each element one by one until a match is found.

2.2 the data must be sorted.

2.3 binary search.

3.1 B.

3.2 B.

3.3 (a) binary search. (b) about 5. (c) linear search.