

4.17 Recursive Searching and Sorting

Name: _____ Class: _____ Date: _____ Total: 9 marks

KEY WORDS merge sort 归并排序 • binary search 二分搜索

Objective

Build the skills to answer exam questions on **recursive searching and sorting**.

You must be able to:

- describe how **binary search** can be written as a **recursive** method
- trace a recursive binary search halving the range on each call
- describe how **merge sort** 归并排序 splits, sorts, and merges

1 Worked examples

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

■ Recursive binary search

Binary search is naturally recursive: check the **middle**; if the target is smaller, **re-curse on the left half**, else recurse on the right — each call halves the range.

■ Merge sort

1. **Split** the collection into two halves.
2. **Sort each half** (recursively, using merge sort).
3. **Merge** the two sorted halves into one sorted collection.

2 Practice

2.1 State how binary search can be written recursively. [1]

2.2 State the three steps of merge sort. [2]

2.3 State what merge sort does after sorting the two halves. [1]

3 Exam-style questions

3.1 Merge sort works by [1]

- | | |
|---|---|
| A | B |
| C | D |
- A checking each element in turn
 - B splitting, sorting each half, and merging
 - C swapping neighbouring elements only
 - D not sorting at all

3.2 A recursive binary search calls itself on [1]

- | | |
|---|---|
| A | B |
| C | D |
- A the whole list again
 - B the correct half of the list
 - C a random half
 - D nothing

3.3 Merge sort is applied to a list.

- (a) State the first step. [1]
- (b) State what happens to each half. [1]
- (c) State the final step. [1]