

Exercise walk-through

Sorting Algorithms ■ 4.15

eXercise

You must be able to

- describe how **selection sort** 选择排序 moves the smallest remaining value into place
- describe how **insertion sort** 插入排序 builds a sorted section one element at a time
- trace a collection after each pass of a sort

Method — Selection sort

Repeatedly find the **smallest remaining** value and move it into its place at the front of the unsorted part.

Method — Insertion sort

Build a **sorted section** at the front, one element at a time, inserting each new value into its correct spot.

Method — Tracing (selection sort on $\{3, 1, 2\}$)

- Pass 1: smallest is 1 $\rightarrow \{1, 3, 2\}$
- Pass 2: smallest of the rest is 2 $\rightarrow \{1, 2, 3\}$

Practice 2.1 ■ 1 mark

Describe how selection sort works.

Solution 2.1

Worked steps

it repeatedly finds the smallest remaining value and moves it into place at the front of the unsorted part **B1**.

Practice 2.2 ■ 1 mark

Describe how insertion sort works.

Solution 2.2

Method: Insertion sort

Worked steps

it builds a sorted section one element at a time, inserting each new value in order

B1.

Practice 2.3 ■ 2 marks

After one pass of selection sort on $\{5, 2, 8, 1\}$, state the array.

Solution 2.3

Method: Tracing (selection sort on '{3, 1, 2}')

Worked steps

{1, 2, 8, 5} — the smallest (1) is moved to the front **M1** **A1**.

Exam-style 3.1 ■ 1 mark

Selection sort repeatedly moves the _____ remaining value into place.

A largest

B smallest

C middle

D random

Solution 3.1

Method: Selection sort

A largest

B smallest



C middle

D random

Worked steps

B.

Exam-style 3.2 ■ 1 mark

Insertion sort builds a

- A** random section
- B** sorted section one element at a time
- C** 2D array
- D** linked list

Solution 3.2

Method: Insertion sort

- A random section
- B sorted section one element at a time** 
- C 2D array
- D linked list

Worked steps

B.

Exam-style 3.3 ■ 1 mark

Apply selection sort to {4, 1, 3, 2} (smallest moved to the front each pass).

- (a) State the array after pass 1.
- (b) State the array after pass 2.
- (c) State the fully sorted result.

Solution 3.3

Worked steps

(a) $\{1, 4, 3, 2\}$ **B1**. (b) $\{1, 2, 3, 4\}$ **B1**. (c) $\{1, 2, 3, 4\}$ **B1**.