

Exercise walk-through

2D Array Traversals ■ 4.12

eXercise

You must be able to

- **traverse** a 2D array using **nested loops** 嵌套循环
- visit elements in **row-major order** 行优先
- use nested enhanced for loops

Method — Nested-loop traversal

Use an outer loop over rows and an inner loop over columns:

```
kfor+w p(k+ktint+w nr+w o+=w l+m+mi0p;+w nr+w o+w ngp.n+nalengthp;+w nro+o
+w      kfor+w p(k+ktint+w nc+w o+=w l+m+mi0p;+w nc+w o+w ngo[l+m+mi0o]p.n+n
+w          nSystemp.n+naoutp.n+naprintp(ngo[nro]o[nco]p)p;
```

Method — Row-major order

This visits elements in **row-major order** — it finishes each **row** completely before moving to the next. A 2D array of R rows and C columns has $R \times C$ elements.

Practice 2.1 ■ 1 mark

State how many loops are needed to traverse a 2D array.

Solution 2.1

Worked steps

two (nested loops) **B1**.

Practice 2.2 ■ 1 mark

State what “row-major order” means.

Solution 2.2

Method: Row-major order

Worked steps

it visits each row completely before moving to the next row **B1**.

Practice 2.3 ■ 1 mark

State how many elements a 3×4 2D array has.

Solution 2.3

Method: Row-major order

Worked steps

$$3 \times 4 = 12 \text{ (B1).}$$

Exam-style 3.1 ■ 1 mark

A 2D array is traversed with

A one loop

B nested loops

C no loop

D a switch statement

Solution 3.1

A one loop

B nested loops



C no loop

D a switch statement

Worked steps

B.

Exam-style 3.2 ■ 1 mark

Row-major order visits

- A** each column fully first
- B** each row fully before the next
- C** elements at random
- D** elements backwards

Solution 3.2

Method: Row-major order

- A each column fully first
- B each row fully before the next 
- C elements at random
- D elements backwards

Worked steps

B.

Exam-style 3.3 ■ 1 mark

A 2D array has 3 rows and 5 columns.

- (a) State the total number of elements.
- (b) State how many loops traverse it.
- (c) Name the order that completes each row first.

Solution 3.3

Method: Row-major order

Worked steps

(a) 15 **B1**. (b) two (nested) **B1**. (c) row-major order **B1**.