

4.12 2D Array Traversals

Name: _____ Class: _____ Date: _____ **Total: 8 marks**

KEY WORDS row-major order 行优先 • nested loops 嵌套循环 • array 数组 • 2d array 二维数组
• traverse 遍历

Objective

Build the skills to answer exam questions on **2D array traversals**.

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

1 Worked examples

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

■ Nested-loop traversal

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

```
for (int r = 0; r < g.length; r++)
    for (int c = 0; c < g[0].length; c++)
        System.out.print(g[r][c]);
```

■ 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.

2 Practice

2.1 State how many loops are needed to traverse a 2D array. [1]

2.2 State what “row-major order” means. [1]

2.3 State how many elements a 3×4 2D array has. [1]

3 Exam-style questions

3.1 A 2D array is traversed with [1]

- **A** one loop
- **B** nested loops
- **C** no loop
- **D** a switch statement

3.2 Row-major order visits [1]

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

3.3 A 2D array has 3 rows and 5 columns.

(a) State the total number of elements. [1]

(b) State how many loops traverse it. [1]

(c) Name the order that completes each row first. [1]

Solutions

2.1 two (nested loops).

2.2 it visits each row completely before moving to the next row.

2.3 $3 \times 4 = 12$.

3.1 B.

3.2 B.

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