AP COMPUTER SCIENCE A • EXERCISE SHEET

4.13 Implementing 2D Array Algorithms

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

Objective

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

You must be able to:

- sum, count, or search the elements of a **2D array** 二维数组
- find the maximum or minimum across a whole 2D array
- process a single **row** or a single **column**

1 Worked examples

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

Summing a 2D array

Use nested loops and accumulate a total:

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

One row or column

To process a single **row** `r`, loop over `g[r]`. To process a single **column** `c`, fix `c` and loop the **row** index.

2 Practice

2.1 Describe how to sum every element of a 2D array. [1]

2.2 State how to process a single row `r` of a 2D array `g`. [1]

2.3 For `int[][] g = {{1, 2}, {3, 4}};`, find the sum of all elements. [2]

3 Exam-style questions

3.1 To find the maximum across a whole 2D array, you [1]

- **A** sum all the elements
- **B** track the largest value over all elements
- **C** sort the rows
- **D** count the elements

3.2 To sum a single column, you fix the [1]

- **A** row index
- **B** column index
- **C** both indices
- **D** neither index

3.3 `int[][] g = {{2, 4}, {6, 8}};`.

(a) State the sum of all elements. [1]

(b) State the sum of row 0. [1]

(c) State the sum of column 1. [1]

4 Go further

- work through the **4.13 Implementing 2D Array Algorithms** lesson on the **Learn** page;
- read the **2D Array** section of the AP Computer Science A handout on the **Know** page.

Solutions

2.1 use nested loops to add every element to a running total.

2.2 loop over the elements of `g[r]`.

2.3 $1 + 2 + 3 + 4 = 10$.

3.1 B.

3.2 B.

3.3 (a) 20. (b) $2 + 4 = 6$. (c) $4 + 8 = 12$.