2.11 1D and 2D Array Processing: Writing and Tracing Programs: 10-minute Pack

OCR J277 · Calculators not allowed · about 10 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Explain the difference between accessing a single element of a 1D array and a single element of a 2D array.

(Total for Question 1 is 2 marks)

2 State one advantage of using a single 2D array, rather than several separate 1D arrays, to store a grid of related data such as a seating plan.

(Total for Question 2 is 2 marks)

3 A weather station records rainfall, in mm, for 3 towns over 5 days in a 2D array called rainfall, where the first index is the town number (0 to 2) and the second index is the day number (0 to 4):

rainfall = [[2, 0, 5, 8, 1], [0, 0, 3, 4, 2], [6, 4, 7, 5, 3]]

Describe, using structured English or pseudocode, an algorithm to find which town (index 0, 1 or 2) had the highest total rainfall across the 5 days, and state the total for that town.

(Total for Question 3 is 6 marks)

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Mark scheme · 2.11 1D and 2D Array Processing: Writing and Tracing Programs: 10-minute Pack

Question 1

a 1D array element is accessed using a single index, e.g. scores[3], oe **B1**

a 2D array element is accessed using two indices, one for the row and one for the column, e.g. grades[1][2], oe **B1**

Answer: A 1D array uses one index, e.g. scores[3]; a 2D array uses two indices, one for the row and one for the column, e.g. grades[1][2].

Question 2

a single 2D array keeps all the related data grouped together under one name, oe **B1**

this makes it possible to process the whole grid using nested loops, rather than writing separate code to handle several differently-named 1D arrays, oe **B1**

Answer: A 2D array keeps all the related data under one name, so nested loops can process the whole grid, rather than needing separate code for several differently-named 1D arrays.

Question 3

Level 1 A basic or partial idea is given (e.g. only calculating one town's total, or only stating an answer with no method), with little use of correct pseudocode/structured English. **1-2**

Level 2 An algorithm is described that calculates the total rainfall for each town, using loops correctly for at least the row-total part, but the method for finding which town has the highest total is incomplete, unclear, or missing. **3-4**

Level 3 A complete, correctly ordered algorithm is described (in pseudocode or clear structured English) that calculates each town's total rainfall using a loop, then correctly identifies the town with the highest total (e.g. by comparing totals as they are calculated, similar to a find-the-maximum pattern), and the correct town and total (town 2, 25mm) are stated. **5-6**

Indicative content:

- For each town (row), loop through its 5 days and add up the rainfall values to get that town's total
- Keep track of the highest total seen so far, and which town it belongs to, updating them whenever a new town's total is higher
- This is similar to the standard find-the-maximum pattern, but applied to a total calculated for each row rather than to single stored values
- After checking all 3 towns, output the town with the highest total and its rainfall total
- Working: town 0 total = 2+0+5+8+1 = 16; town 1 total = 0+0+3+4+2 = 9; town 2 total = 6+4+7+5+3 = 25
- Town 2 has the highest total rainfall, with 25mm

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