

Cambridge IGCSE Computer Science (0478)

Interactive Differentiated Worksheet: 1D & 2D Array Operations

Student Information

- **Name:** _____
- **Date:** _____
- **Target Grade:** ☐ Foundation | ☐ Intermediate | ☐ Extended

Key Exam Reference (1-Based Indexing)

In Cambridge IGCSE Pseudocode (0478), array indices strictly start at **1** unless explicitly declared otherwise.

- **1D Array Declaration:**

```
DECLARE StudentMarks : ARRAY[1:5] OF INTEGER
```

- **2D Array Declaration:**

```
DECLARE CityTemps : ARRAY[1:3, 1:4] OF REAL (3 Rows, 4 Columns)
```

Level 1: Foundation

Focus: Array terminology, direct indexing, and basic 1D array traversal.

Task 1.1: Array Terminology Match-Up

Match each term to its correct definition by writing the corresponding letter:

1. **Subscript / Index** [____]
2. **1D Array** [____]
3. **Element** [____]
4. **2D Array** [____]

Definitions:

- **A.** An individual data value stored within an array.
- **B.** A collection of elements organized in rows and columns.
- **C.** A single list of data elements stored sequentially under one variable name.
- **D.** The numerical position used to reference a specific item inside an array.

Task 1.2: Reading 1D Array Values

Given the following array declaration and initial values: `DECLARE Numbers : ARRAY[1:6] OF INTEGER`

Index	1	2	3	4	5	6
Value	12	45	8	99	34	21

State the value stored in each location:

1. `Numbers[2]` = _____
2. `Numbers[5]` = _____
3. `Numbers[1] + Numbers[3]` = _____

Task 1.3: Trace Table - 1D Traversal

Complete the missing entries in the trace table for the pseudocode below.

```
DECLARE Scores : ARRAY[1:4] OF INTEGER
Scores[1] ← 10
Scores[2] ← 25
Scores[3] ← 15
Scores[4] ← 30
```

```
Total ← 0
FOR i ← 1 TO 4
    Total ← Total + Scores[i]
ENDFOR
```

Trace Table

Step	i	Scores[i]	Total
1	1	10	10
2	2	25	[A]

3	3	[B]	50
4	4	30	[C]

- [A] = _____
- [B] = _____
- [C] = _____

Level 2: Intermediate

Focus: Totals, averages, linear search algorithms, and basic 2D array traversal.

Task 2.1: 2D Array Direct Access

A school records paper recycling in kg across 3 classrooms over 3 days using a 2D array

Recycling[1:3, 1:3]:

Row (Class) \ Col (Day)	Col 1 (Day 1)	Col 2 (Day 2)	Col 3 (Day 3)
Row 1 (Class A)	14	18	12
Row 2 (Class B)	22	19	25
Row 3 (Class C)	10	15	11

1. Identify the value at Recycling[2, 3]: _____
2. Identify the position (Row, Col) for value 18: Recycling[__ , __]
3. Write a pseudocode statement to assign the value 30 to Class C on Day 2: Recycling[_____] ← 30

Task 2.2: Complete the Linear Search Pseudocode

Fill in the blanks in the standard Cambridge Linear Search algorithm below:

```
DECLARE Target : INTEGER
DECLARE Found : BOOLEAN
Found ← FALSE
Target ← 42

FOR i ← 1 TO 10
    IF Marks[i] = _____ THEN
        Found ← _____
        OUTPUT "Match found at position ", _____
    ENDIF
ENDFOR
```

Task 2.3: Trace Table - Finding Maximum Value

Trace the execution of this algorithm finding the highest temperature:

```
DECLARE Temps : ARRAY[1:5] OF INTEGER  
// Temps values are [38, 42, 40, 45, 41]
```

```
MaxTemp ← Temps[1]  
FOR i ← 2 TO 5  
    IF Temps[i] > MaxTemp THEN  
        MaxTemp ← Temps[i]  
    ENDIF  
ENDFOR
```

Trace Table

i	Temps[i]	Temps[i] > MaxTemp (TRUE/FALSE)	MaxTemp
-	-	-	38
2	42	TRUE	42
3	40	[A]	42
4	45	[B]	[C]
5	41	FALSE	42

- [A] = _____
- [B] = _____
- [C] = _____

Level 3: Extended / Higher

Focus: 2D array nested loops, row/column totals, error detection, and cross-curricular structure selection.

Task 3.1: 2D Array Nested Loop Row Total

Write pseudocode to calculate and output the total for **each row** in a 2D array Grid[1:4, 1:5].

```
// Write your solution using Cambridge Pseudocode standard below:
DECLARE Grid : ARRAY[1:4, 1:5] OF INTEGER
DECLARE RowTotal : INTEGER

FOR i ← 1 TO ____
    RowTotal ← ____
    FOR j ← 1 TO ____
        RowTotal ← ____
    ENDFOR
    OUTPUT "Total for Row ", i, " is: ", RowTotal
ENDFOR
```

Task 3.2: Debugging Challenge (Index & Boundary Errors)

A student wrote the following pseudocode to calculate the average mark from an array of 5 students, but it contains **two runtime/logic errors**.

```
DECLARE Marks : ARRAY[1:5] OF INTEGER
Total ← 0

FOR i ← 0 TO 5
    Total ← Total + Marks[i]
ENDFOR

Average ← Total / 6
OUTPUT Average
```

1. Identify Error 1 & Fix:

- Problem: _____
- Correction: _____

2. Identify Error 2 & Fix:

- Problem: _____
- Correction: _____

Task 3.3: Real-World Scenario Justification (UAE Context)

For each real-world context, select whether a **1D Array** or **2D Array** is most appropriate, and give a clear exam-style justification.

Scenario A: UAE Weather Station

- *Context:* Storing the daily maximum temperature for 7 cities in the UAE over 30 days.
- *Choice:* ☐ 1D Array | ☐ 2D Array
- *Justification:* _____

Scenario B: School Athletics 100m Sprint Timings

- *Context:* Storing the personal best timing in seconds for 12 runners on the school track team.
- *Choice:* ☐ 1D Array | ☐ 2D Array
- *Justification:* _____