Unit 8: 2D Arrays

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Unit 8 Overview

In Unit 8, you'll explore the 2D Array data structure.

Topics will include:

- Declaring and Instantiating 2D Arrays of various sizes
- Accessing 2D Array elements
- Traversing a 2D Array through row-major and column-major order
- Standard 1D Array algorithms (6.4) apply to 2D Arrays

Lesson 8.1: 2D Array Basics

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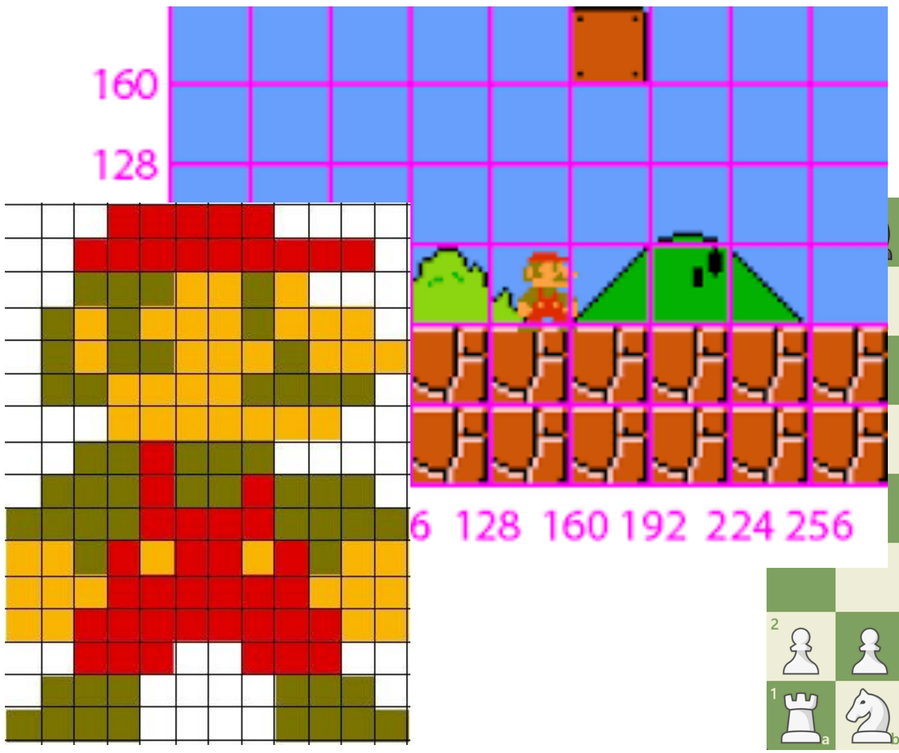
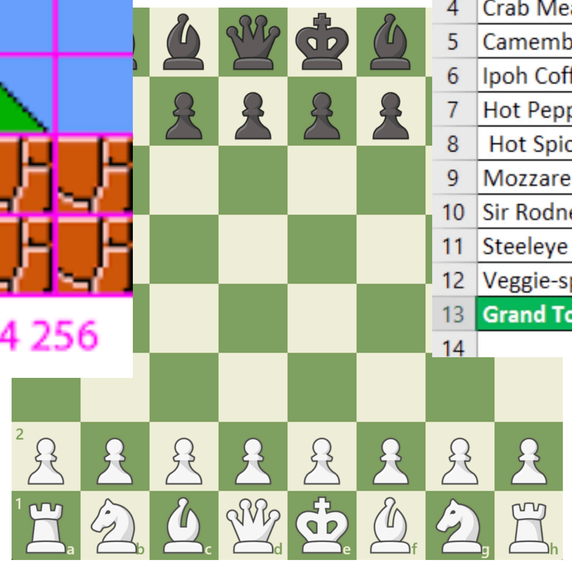
8.1 2D Arrays

Overview (1/2)

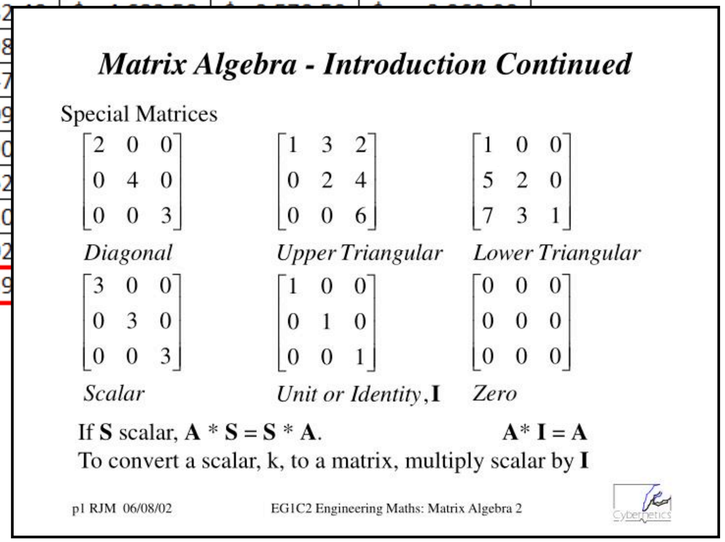
If a 1D Array stores a row of values, then 2D arrays store a GRID of values, and grids are useful for many applications.





B13 =SUM(B3:B12)

	A	B	C	D	E
1		Sales in Each Quarter			
2	Product Name	Jan'2018	April'2018	July'2018	October'2018
3	ABC Mutton	$ 2,667.60	$ 4,013.10	$ 4,836.00	$ 6,087.90
4	Crab Meat	$ 1,768.41	$ 1,978.00	$ 4,412.32	$ 1,656.00
5	Camembert Pierrot	$ 3,182			
6	Ipoh Coffee	$ 1,398			
7	Hot Pepper Sauce	$ 1,347			
8	Hot Spiced Okra	$ 1,509			
9	Mozzarella di Giovanni	$ 1,390			
10	Sir Rodney's Scones	$ 1,462			
11	Steeleye Stout	$ 1,310			
12	Veggie-spread	$ 3,202			
13	Grand Total	$ 19,239			
14					



Matrix Algebra - Introduction Continued

Special Matrices

$$\begin{bmatrix} 2 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 3 \end{bmatrix} \quad \begin{bmatrix} 1 & 3 & 2 \\ 0 & 2 & 4 \\ 0 & 0 & 6 \end{bmatrix} \quad \begin{bmatrix} 1 & 0 & 0 \\ 5 & 2 & 0 \\ 7 & 3 & 1 \end{bmatrix}$$

Diagonal *Upper Triangular* *Lower Triangular*

$$\begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix} \quad \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \quad \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

Scalar *Unit or Identity*, **I** *Zero*

If **S** scalar, **A** * **S** = **S** * **A**. **A*** **I** = **A**

To convert a scalar, k, to a matrix, multiply scalar by **I**

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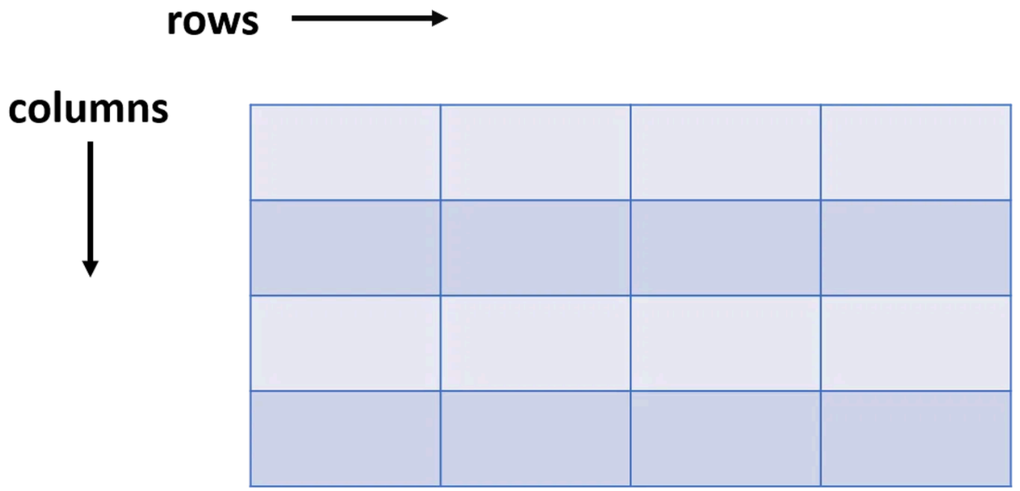
8.1 2D Arrays

Overview (2/2)

Grids are made up of **rows** and **columns**, and the location of data within the grid is meaningful.



To create a 2D array, you use the syntax:

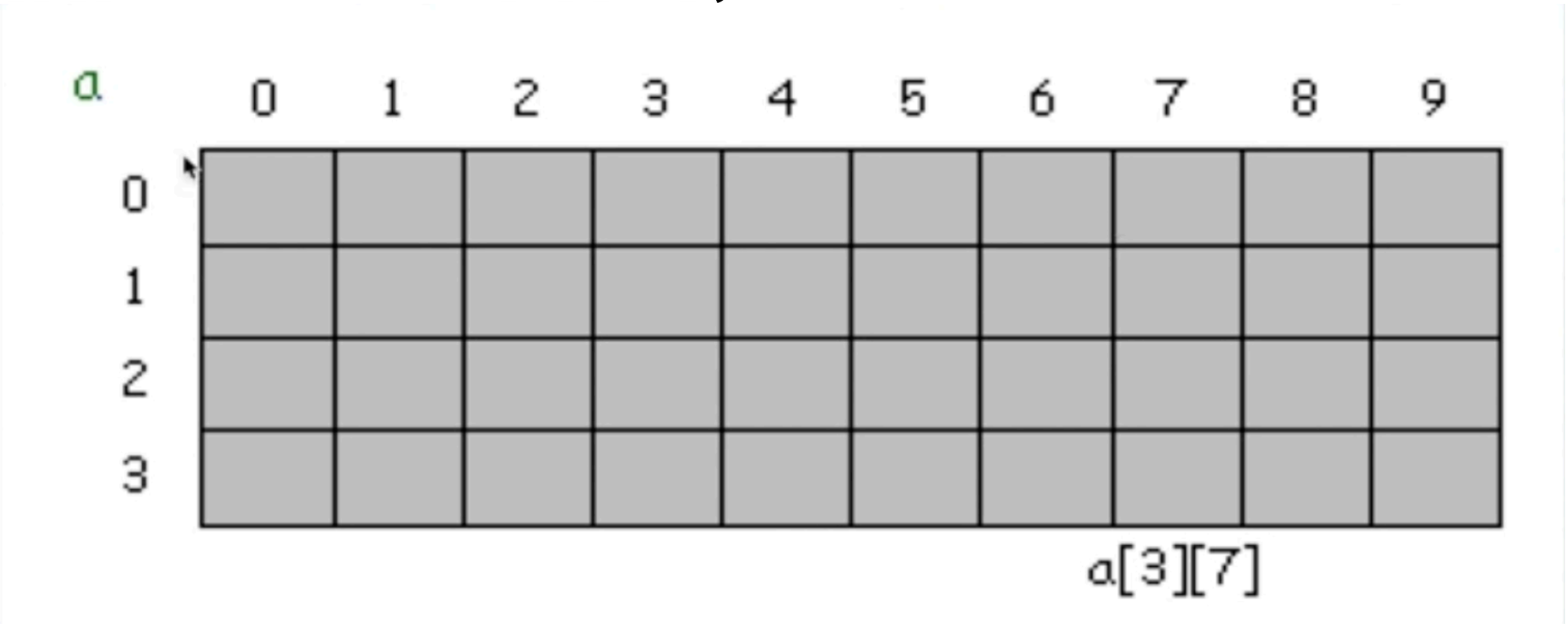
```
int[][] grid = new int[rows][columns];
```

8.1 2D Arrays

Instantiation

Here is a 2D Array with 4 rows, 10 columns. Note the indices count from zero.

```
int[][] a = new int[4][10];
```

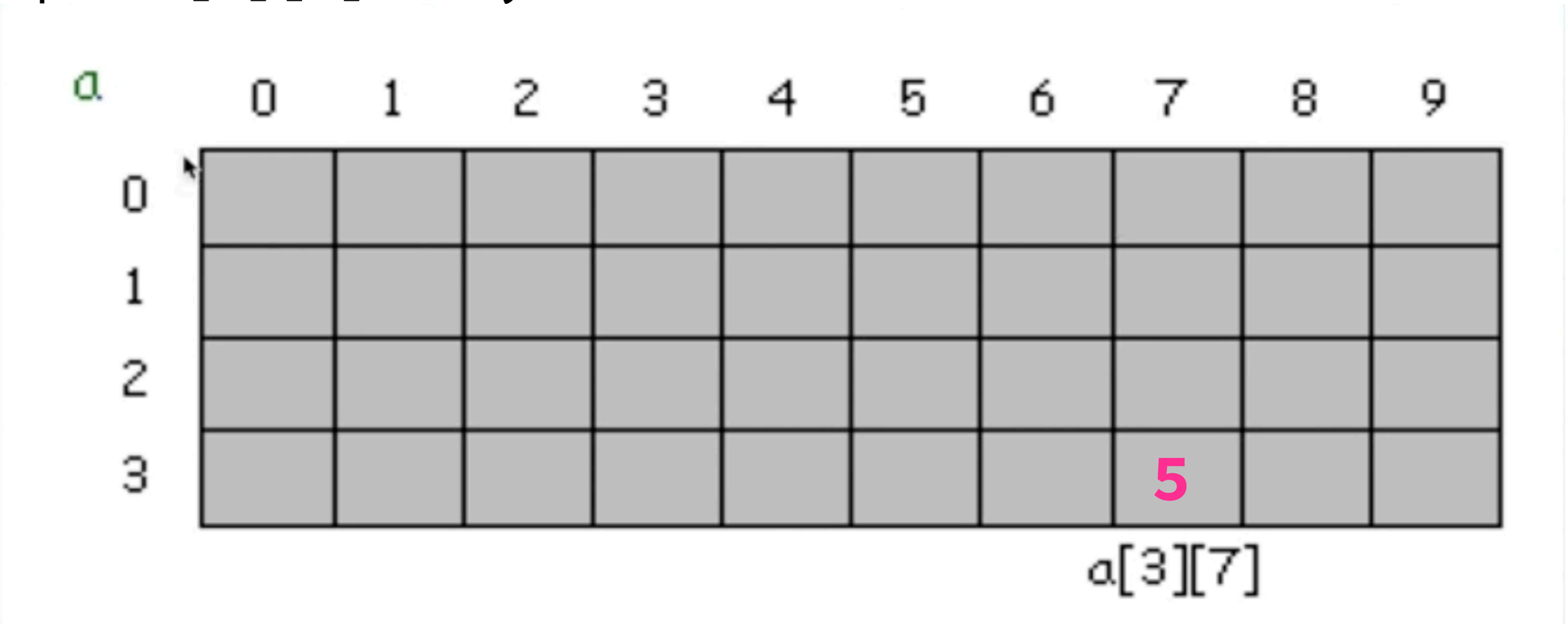


8.1 2D Arrays

Accessing Elements

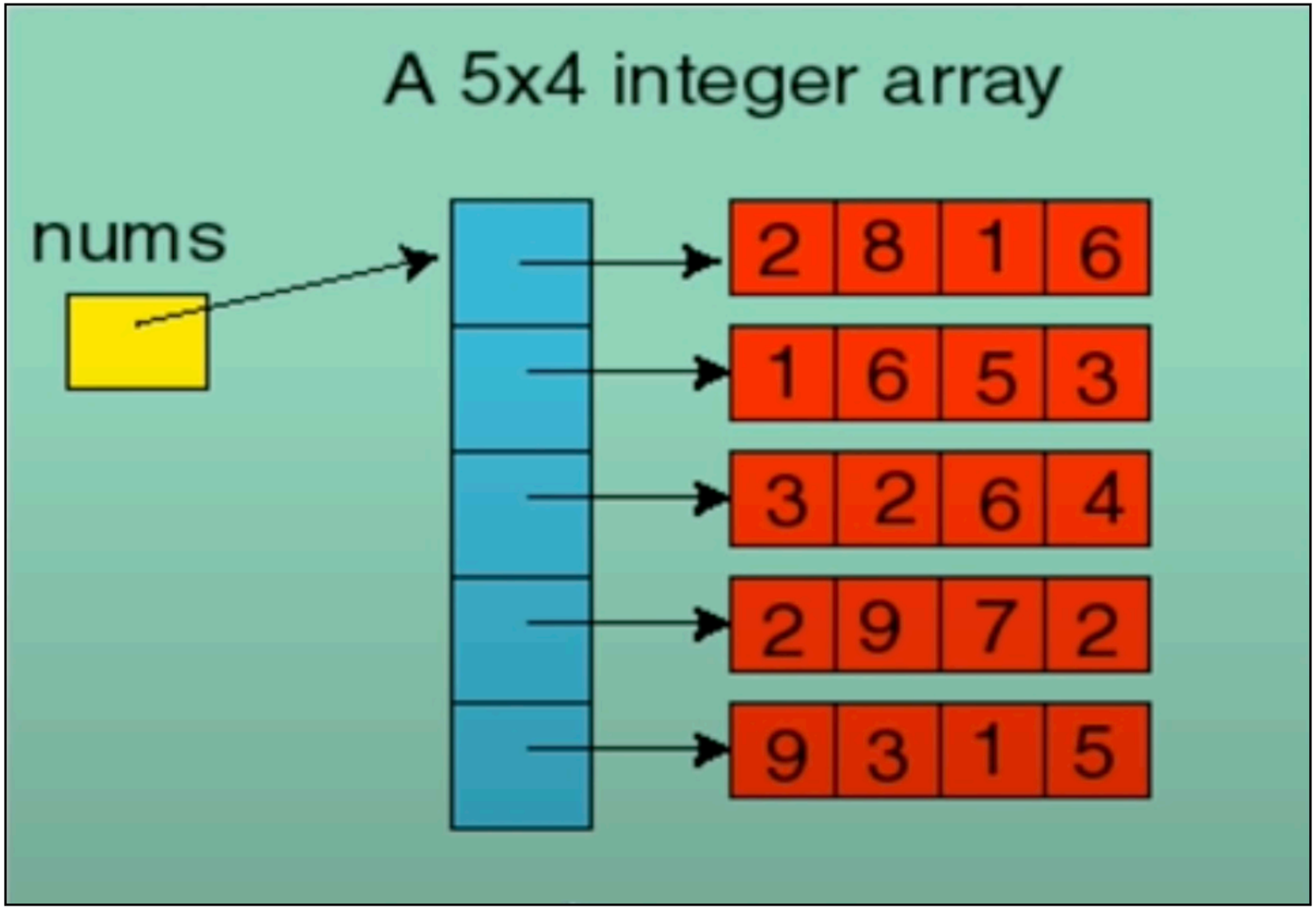
Accessing elements in 2D arrays requires both the row and column.

Example: **`a[3][7] = 5;`**



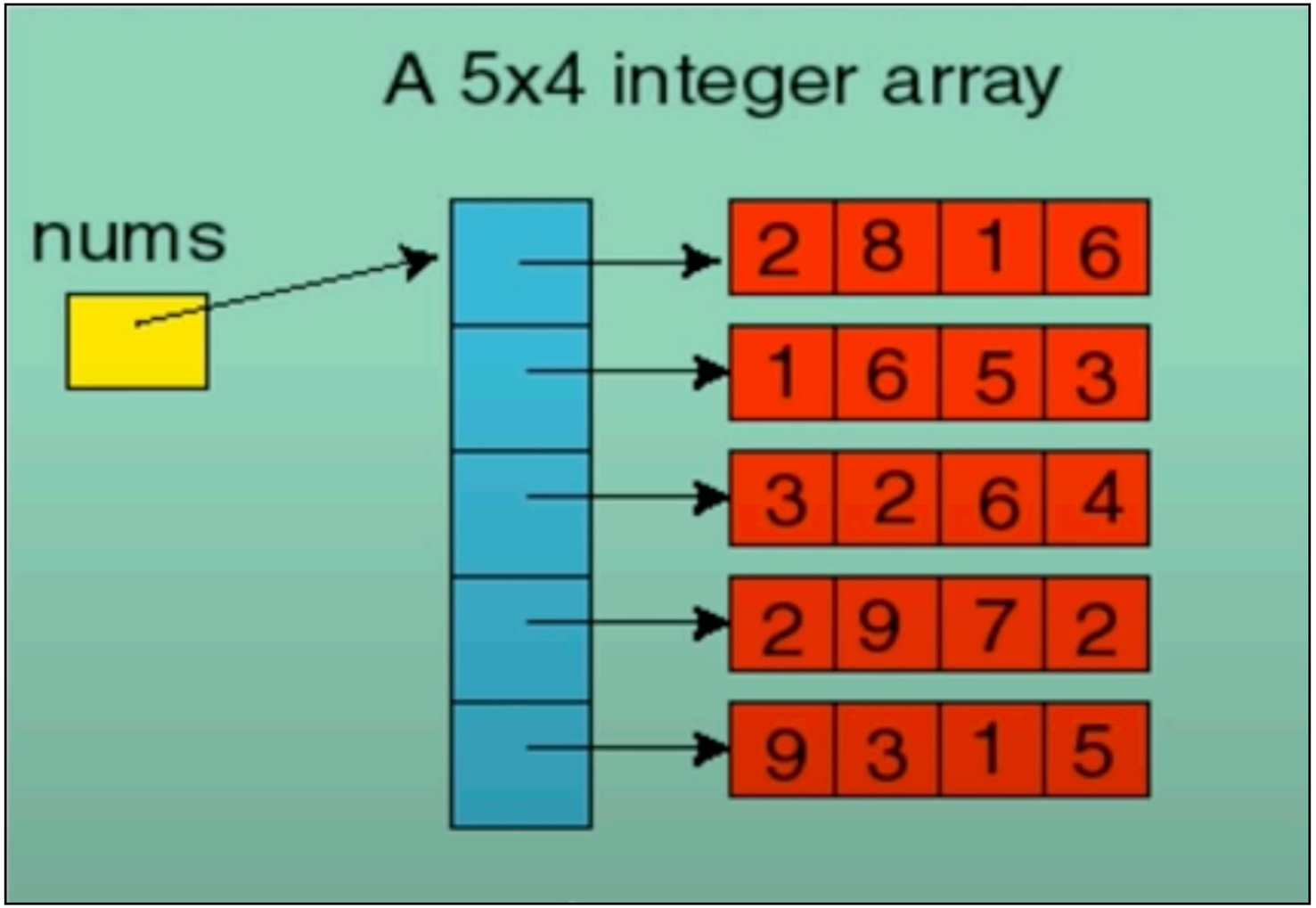
A 2D array is really an 1D array that contains 1D arrays. For example:

```
int[][] nums = new int[5][4];
```



Finding the number of rows: **`nums.length;`**

Finding the number of columns: **`nums[0].length;`**



Lesson 8.2: Traversing 2D Arrays

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8.2 Traversing 2D Arrays

To traverse an array, use a nested loop!

```
for (int row = 0; row < nums.length; row++) {
   for (int col = 0; col < nums[0].length; col++) {
      System.out.print (grid[row][col]);
   }
   System.out.println();
}
```