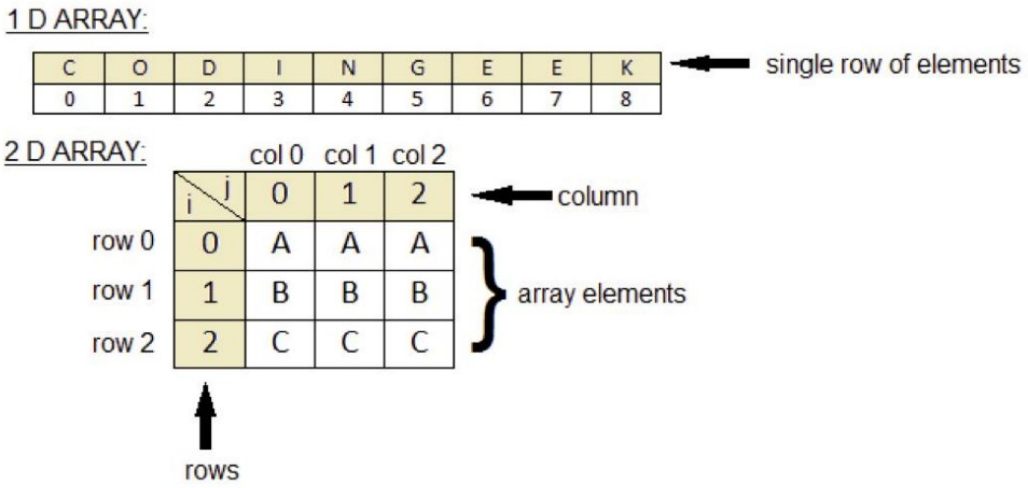
TOPIC 5 - ABSTRACT DATA STRUCTURES (HL ONLY)

- **2D Arrays**
- **Stacks**
- **Queues**
- **Linked Lists**
- **Trees**

LESSON 1 - Two Dimensional Arrays

As the name suggests, a two dimensional array will allow us to model data that is two dimensional in nature. Programming uses for this include spreadsheets, databases and 2D games.



As with one dimensional arrays, we have a couple of methods of declaring static 2D arrays with Java.

Method 1

```
int numbers[][]= { {25,10, 5},  //row 0
                   { 4, 6,13},  //row 1
                   {45,90,78}   //row 2
                 };

for (int row=0; row<numbers.length; row++) {
    for (int col=0; col<numbers[row].length; col++) {
        int val = numbers[row][col];
        System.out.println("numbers["+row+"]["+col+"] = "+val);
    }
}
```

Method 2

```
int numbers[][] = new int[3][3];

numbers[0][0] = 25;
numbers[0][1] = 10;
numbers[0][2] = 5;
numbers[1][0] = 4;
numbers[1][1] = 6;
numbers[1][2] = 13;
numbers[2][0] = 45;
numbers[2][1] = 90;
```

```
numbers[2][2] = 78;

// using the other for-loop method
for (int[] row : numbers) {
    for (int cell : row) {
        System.out.println( cell );
    }
}
```

2D array questions

A teacher has decided to use a 2D array to store the marks for one of their classes. The grade book takes the following form:

Marksbook	Test 1	Test 2	Test 3	Test 4	Test 5
Student A	67%	50%	93%	83%	43%
Student B	70%	52%	96%	85%	48%
Student C	90%	81%	100%	93%	68%
Student D	55%	32%	71%	72%	58%
Student E	60%	47%	65%	74%	61%

Convert the above into a suitable 2D array then write code to determine the following

1. Determine the overall average mark
2. Determine the average mark for each individual student
3. Determine the average mark for each individual assessment
4. Given the following grade cutoffs, determine the grade for each student: A = 85%, B = 70%, C = 55%, D = 40%, F < 40%