

2D Arrays (Matrices)

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Before we begin

- Make sure you have Java & Java JDK downloaded on your computer
 - can run **java -version** in terminal to check
- Make sure you have IntelliJ downloaded on your computer
- *Suggested:* Watch previous Java tutorials

What is a 2D array?

A 2D array, also known as a matrix, is an array of arrays.

Matrices in Java are row major which means they are indexed first by row and then by column.

2D arrays, like normal arrays, are 0 indexed

Matrix Code

```
// empty initialization 3x4 array
int[][] mat = new int[3][4];

// accessing a single row, row 0
int[] row = mat[0];

// accessing a single element, row 1 column 2
int element = mat[1][2];

// setting a single element, row 1 column 2
mat[1][2] = 12;
```

Visualization of parts of a 2D array

The diagram shows a 2D array named `mat` with 3 rows and 4 columns. The rows are indexed 0, 1, and 2, and the columns are indexed 0, 1, 2, and 3. All elements in the array are 0. A large purple bracket on the left side of the array is labeled `mat`. A purple oval highlights the element at row 1, column 2. A purple arrow points from the text `mat[1][2]` to this highlighted element. A purple bracket on the right side of the first row is labeled `mat[0]`. The labels 'row' and 'column' are placed at the bottom and right of the grid respectively.

	0	1	2	3	column
0	0	0	0	0	} <code>mat[0]</code>
1	0	0	0	0	
2	0	0	0	0	
row					

Getting number of rows and columns

```
// number of rows  
mat.length;
```

```
// number of columns in row 0  
mat[0].length;
```

Jagged Matrices

Jagged matrices are matrices where not all the rows have the same number of columns. You can create a jagged matrix by creating an explicit matrix like below.

```
int[][] jaggedMat = {  
    {1, 2, 3},  
    {1, 2, 3, 4, 5},  
    {1, 2}  
};
```

When to use a 2D array

2D arrays are used when you need to represent something in 2D like a game of checkers or a crossword puzzle.

Exercises

Matrix Exercise #1

Time Limit: 7 minutes

Write a method to find the max value in a 2D array of ints

Matrix Exercise #2

Time Limit: 7 minutes

Write a method that finds the sum of values in each column of a 2D array of doubles. The method should return the sum of the columns as an array

Matrix Exercise #3

Time Limit: 5 minutes

Write a method to print out the elements of a 2D array of ints in row order.

Matrix Exercise #4

Time Limit: 7 minutes

Write a method to print out the elements of a 2D array of ints in column order

Practice for Later

Write a program that allows 2 users to play tic tac toe against each other. Your implementation should include user input and a 2D array. Your game should stop either when one of the users wins or the board is completely filled up. Your game should also print the current state of the board after each round of the game. The current state of the board can be formatted however you would like. The user should input their move as 2 numbers indicating the row and column they would like their move to go in. Remember, tic tac toe alternates between Os and Xs.

The End