Array Exercises

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1D Arrays

1. Create an array of integers and print the contents
2. Create an array of Strings and print the contents
3. Create an integer array of length n and initialize all elements with the value of zero
4. Find the index of a value in an array
5. Given an integer array, starting from the first element, update the value of the element so that it is the average of the previous element and the following element

2D Arrays

6. Given two 1D arrays: the first with length n and the second with length m. Create one 2D array of size n x m with the element value the multiplication result of the elements of the 1D arrays
7. Given two 2D arrays of dimensions n x m and m x p, create a 2D array which is the multiplication result of the two arrays
8. Write a method named **gameOfLife** that performs one update on a Game of Life board represented as a 2D array. Conway's Game of Life is a simple representation of cellular automata behavior using a board of characters representing cells. A given cell can be either alive (1) or dead (0). To update the board, each cell's status should change based on the number of living direct neighbors it has in each of the eight directions. The rules are as follows:

- A living cell with 0 or 1 living neighbors dies from underpopulation.
- A living cell with 2 or 3 living neighbors stays alive.
- A living cell with more than 3 living neighbors dies from overpopulation.
- A dead cell with exactly 3 living neighbors comes to life.

For example, suppose the array contains the following state:

```java
int[][] board = {
    {0, 0, 1, 0, 1},
    {0, 0, 1, 0, 0},
    {0, 0, 1, 0, 0},
    {0, 0, 1, 1, 0},
    {0, 0, 0, 0, 0},
};
```

Then the call of `gameOfLife(board)`; should modify it to store the following:

```java
{
    {0, 0, 0, 1, 0},
    {0, 1, 1, 0, 0},
    {0, 1, 1, 0, 0},
    {0, 0, 1, 1, 0},
    {0, 0, 0, 0, 0}
}
```

Your code should work for a board of any size, even one with 0 rows or columns. You may assume that the 2-D array is rectangular, that is, that each row of the 2-D array contains the same number of columns. You may assume that no values appear in the board other than 0 and 1.