2D Arrays Quiz – FRQ

1. Using the method `Math.random()`, and no other methods, fill in the box to complete the code such that the method `randomInt()` will correctly return a random integer within the range [`min`, `max`].

```
private static int randomInt(int min, int max) {
    return [ (int)(Math.random()*(max-min+1))+min ];
}
```

2. Show you know the most basic declaration and initialization of two-dimensional arrays.

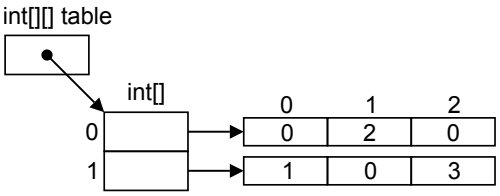
   a) Write a statement that declares a two-dimensional array named `arr` that is intended to store real numbers.

```
double[][] arr;
```

   b) Write a statement that takes the arr variable declared in part (a), and allocates memory to store an array with four rows (four `double` arrays, `double[]`) and five columns (five `double` elements per `double[]`).

```
arr = double[4][5];
```

3. Consider the conceptual diagram of the memory structure to the right, and answer the following questions.



   a) Write a statement that will declare the variable `table`, allocate memory, and initialize to the values shown in the diagram to the right.

```
int[][] table = new int[2][3];
table[0][1] = 2;
table[1][0] = 1;
table[1][2] = 3;
```

```
int[][] table = {
  { 0, 2, 0 },
  { 1, 0, 3 }
};
```

4. Write a method that takes two parameters: a two-dimensional array of `String` labeled `arr`, and a `String` labeled `value`. The method is to perform *linear search* to search for `value`. If `value` is in `arr`, the method is to return the row number of the first row where it is found. If `value` is not in `arr`, the method is to return `-1`.

```
public static int linearSearchEnhanced(String[][] arr, String value) {
     for(int i = 0; i < arr.length; i++) {
          for(String s : arr[i]) {
               if(s.equals(value)) {
                    return i;
               }
          }
     }
     return -1;
}

public static int linearSearch(String[][] arr, String value) {
     for(int i = 0; i < arr.length; i++) {
          for(int j = 0; j < arr[i].length; j++) {
               if(arr[i][j].equals(value)) {
                    return i;
               }
          }
     }
     return -1;
}
```

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5. Write the code specified in the box provided.

a) Write a Java method that creates and returns a 2-dimensional array of integers with dimensions given by parameters `rows` and `cols`. The array returned should be populated with values such that each element in the array is equal to the product of its row and column index. For example, the element at position (2,3) should be 6. The method declaration has been given.

```
public static int[][] getArray(int rows, int cols)

{
   int[][] array = new int[rows][cols]; // 1 point allocate
   for (int i = 0; i < array.length; i++) { // 1 point
      for (int j = 0; j < array[i].length; j++) {
         array[i][j] = i*j; // 1 point assignment
      }
   }
   return array; // 1 point return array
}
```

b) Using ***enhanced for loops only***, write a Java method that will print out the array from part a. The method declaration has been given.

```
public static void printArray(int[][] a)

{
   for (int[] row: a) { // 1 point enhanced for
      for (int i: row) {
         System.out.print(i + " ");// 1 point print all elements
      }
      System.out.println();// 1 point format correct
   }
}
```

c) Given the methods above, write the output printed by the following line of code.

```
printArray(getArray(3,4));
```

```
0 0 0 0
0 1 2 3
0 2 4 6
```