

4. This question involves manipulating a two-dimensional array of integers. You will write two static methods of the `ArrayResizer` class, which is shown below.

```
public class ArrayResizer
{
    /** Returns true if and only if every value in row r of array2D is non-zero.
     * Precondition: r is a valid row index in array2D.
     * Postcondition: array2D is unchanged.
     */
    public static boolean isNonZeroRow(int[][] array2D, int r)
    { /* to be implemented in part (a) */ }

    /** Returns the number of rows in array2D that contain all non-zero values.
     * Postcondition: array2D is unchanged.
     */
    public static int numNonZeroRows(int[][] array2D)
    { /* implementation not shown */ }

    /** Returns a new, possibly smaller, two-dimensional array that contains only rows
     * from array2D with no zeros, as described in part (b).
     * Precondition: array2D contains at least one column and at least one row with no zeros.
     * Postcondition: array2D is unchanged.
     */
    public static int[][] resize(int[][] array2D)
    { /* to be implemented in part (b) */ }
}
```

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- (a) Write the method `isNonZeroRow`, which returns `true` if and only if all elements in row `r` of a two-dimensional array `array2D` are not equal to zero.

For example, consider the following statement, which initializes a two-dimensional array.

```
int[][] arr = {{2, 1, 0},
               {1, 3, 2},
               {0, 0, 0},
               {4, 5, 6}};
```

Sample calls to `isNonZeroRow` are shown below.

Call to <code>isNonZeroRow</code>	Value Returned	Explanation
<code>ArrayResizer.isNonZeroRow(arr, 0)</code>	<code>false</code>	At least one value in row 0 is zero.
<code>ArrayResizer.isNonZeroRow(arr, 1)</code>	<code>true</code>	All values in row 1 are non-zero.
<code>ArrayResizer.isNonZeroRow(arr, 2)</code>	<code>false</code>	At least one value in row 2 is zero.
<code>ArrayResizer.isNonZeroRow(arr, 3)</code>	<code>true</code>	All values in row 3 are non-zero.

Complete the `isNonZeroRow` method.

```
/** Returns true if and only if every value in row r of array2D is non-zero.
 *   Precondition: r is a valid row index in array2D.
 *   Postcondition: array2D is unchanged.
 */
public static boolean isNonZeroRow(int[][] array2D, int r)
```

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- (b) Write the method `resize`, which returns a new two-dimensional array containing only rows from `array2D` with all non-zero values. The elements in the new array should appear in the same order as the order in which they appeared in the original array.

The following code segment initializes a two-dimensional array and calls the `resize` method.

```
int[][] arr = {{2, 1, 0},
              {1, 3, 2},
              {0, 0, 0},
              {4, 5, 6}};
int[][] smaller = ArrayResizer.resize(arr);
```

When the code segment completes, the following will be the contents of `smaller`.

```
{{1, 3, 2}, {4, 5, 6}}
```

A helper method, `numNonZeroRows`, has been provided for you. The method returns the number of rows in its two-dimensional array parameter that contain no zero values.

Complete the `resize` method. Assume that `isNonZeroRow` works as specified, regardless of what you wrote in part (a). You must use `numNonZeroRows` and `isNonZeroRow` appropriately to receive full credit.

```
/** Returns a new, possibly smaller, two-dimensional array that contains only rows from array2D
 * with no zeros, as described in part (b).
 * Precondition: array2D contains at least one column and at least one row with no zeros.
 * Postcondition: array2D is unchanged.
 */
public static int[][] resize(int[][] array2D)
```

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Class information for this question

```
public class ArrayResizer

public static boolean isNonZeroRow(int[][] array2D, int r)
public static int numNonZeroRows(int[][] array2D)
public static int[][] resize(int[][] array2D)
```

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