

2017 AP® COMPUTER SCIENCE A FREE-RESPONSE QUESTIONS

Complete method `findPosition` below.

```
/** Returns the position of num in intArr;  
 * returns null if no such element exists in intArr.  
 * Precondition: intArr contains at least one row.  
 */  
public static Position findPosition(int num, int[][] intArr)
```

Part (b) begins on page 18.

2017 AP® COMPUTER SCIENCE A FREE-RESPONSE QUESTIONS

- (b) Write a `static` method `getSuccessorArray` that returns a 2D successor array of positions created from a given 2D integer array.

The *successor* of an integer value is the integer that is one greater than that value. For example, the successor of 8 is 9. A 2D *successor array* shows the position of the successor of each element in a given 2D integer array. The 2D successor array has the same dimensions as the given 2D integer array. Each element in the 2D successor array is the position (row, column) of the corresponding 2D integer array element's successor. The largest element in the 2D integer array does not have a successor in the 2D integer array, so its corresponding position in the 2D successor array is `null`.

The following diagram shows a 2D integer array and its corresponding 2D successor array. To illustrate the successor relationship, the values 8 and 9 in the 2D integer array are shaded. In the 2D successor array, the shaded element shows that the position of the successor of 8 is $(0, 2)$ in the 2D integer array. The largest value in the 2D integer array is 16, so its corresponding element in the 2D successor array is `null`.

2D Integer Array				2D Successor Array				
	0	1	2	3	0	1	2	3
0	15	5	9	10	(1, 1)	(1, 3)	(0, 3)	(1, 2)
1	12	16	11	6	(2, 2)	null	(1, 0)	(2, 3)
2	14	8	13	7	(0, 0)	(0, 2)	(2, 0)	(2, 1)

Class information for this question

```
public class Position  
  
public Position(int r, int c)  
  
public class Successors  
  
public static Position findPosition(int num, int[][] intArr)  
public static Position[][] getSuccessorArray(int[][] intArr)
```