

Question 4: 2D Arrays**9 points****Canonical solution**

a.

```
public SumOrSameGame(int numRows, int numCols)
{
    puzzle = new int[numRows][numCols];

    for (int row = 0; row < numRows; row++)
    {
        for (int col = 0; col < numCols; col++)
        {
            puzzle[row][col] = (int)(Math.random() * 9) + 1;
        }
    }
}
```

4 points

b.

```
public boolean clearPair(int row, int col)
{
    int val1 = puzzle[row][col];
    for (int currRow = row; currRow < puzzle.length; currRow++)
    {
        for (int currCol = 0; currCol < puzzle[0].length; currCol++)
        {
            int val2 = puzzle[currRow][currCol];
            if (currRow != row || currCol != col)
            {
                if (val1 == val2 || val1 + val2 == 10)
                {
                    puzzle[row][col] = 0;
                    puzzle[currRow][currCol] = 0;
                    return true;
                }
            }
        }
    }
    return false;
}
```

5 points

a. SumOrSameGame

Scoring Criteria		Decision Rules	
1	Constructs correctly sized 2D array of <code>int</code> and assigns to instance variable <code>puzzle</code>	Responses will not earn the point if they - fail to update the instance variable <code>puzzle</code>, e.g., by redeclaring as a local variable - print or return a value instead of or in addition to updating <code>puzzle</code>	1 point
2	Traverses 2D array (<i>no bounds errors</i>)	Responses can still earn the point even if they - fail to construct the 2D array, as long as traversal uses correct bounds - fail to assign to the 2D array elements Responses will not earn the point if they - fail to access an element of the 2D array in the traversal	1 point
3	Generates a random integer that is uniform in the range <code>[1, 9]</code>	Responses will not earn the point if they - fail to call <code>Math.random</code> or an equivalent method - make any incorrect call to <code>Math.random</code> or an equivalent method - call <code>random</code> without <code>Math.</code> - fail to cast to an <code>int</code>	1 point
4	Assigns values to 2D array elements (<i>algorithm</i>)	Responses can still earn the point even if they - generate the random value incorrectly - assign to a local 2D array instead of the instance variable - fail to assign some elements due to a bounds error Responses will not earn the point if they - assign a value other than the attempted randomly generated value - correctly initialized the 2D array but now assign somewhere else - assign the same value to all visited elements - fail to assign to all visited elements	1 point

b. `clearPair`

Scoring Criteria		Decision Rules	
5	Accesses all and only necessary elements of <code>puzzle</code> in rows <code>>= row</code> (no bounds errors)	Responses can still earn the point even if they - access additional rows, as long as they also guard against pairing them - pair the element at <code>row</code> and <code>col</code> with itself - omit extra elements due to incorrect self-pairing guard, as long as the bounds would otherwise support accessing all necessary elements - return early, as long as bounds and indices would otherwise support accessing all necessary elements Responses will not earn the point if they - fail to access elements of <code>puzzle</code> correctly	1 point
6	Guards against pairing an element with itself	Responses will not earn the point if they - omit extra potential pairs with their self-pairing guard - have no loop	1 point
7	Determines whether two elements are the same or sum to 10	Responses can still earn the point even if they - pair the element at <code>row</code> and <code>col</code> with itself - have no loop Responses will not earn the point if they - test only one of the conditions	1 point
8	Sets a 2D array element to <code>0</code> (in the context of a loop)	Responses can still earn the point even if they - set only one identified element to <code>0</code> - incorrectly identify elements - set more than 2 elements to <code>0</code>	1 point
9	Sets identified elements to <code>0</code> when match is found and returns appropriate <code>boolean</code> in both cases (algorithm)	Responses can still earn the point even if they - identify elements incorrectly, as long as there is some conditional selection Responses will not earn the point if they - set only one identified element to <code>0</code> - change more than 1 element besides the element at <code>row</code> and <code>col</code> - return an incorrect value due to an early return - return an incorrect value due to not returning after clearing once	1 point
Question-specific penalties			
None			