- 3. This question involves reasoning about the GridWorld case study. Reference materials are provided in the appendixes. In part (a) you will write a method to return an array list of all empty locations in a given grid. In part (b) you will write the class for a new type of Critter.
  - (a) The GridWorldUtilities class contains static methods. A partial declaration of the GridWorldUtilities class is shown below.

Write the GridWorldUtilities method getEmptyLocations. If there are no empty locations in grid, the method returns an empty array list. Otherwise, it returns an array list of all empty locations in grid. Each empty location should appear exactly once in the array list.

WRITE YOUR SOLUTION ON THE NEXT PAGE.

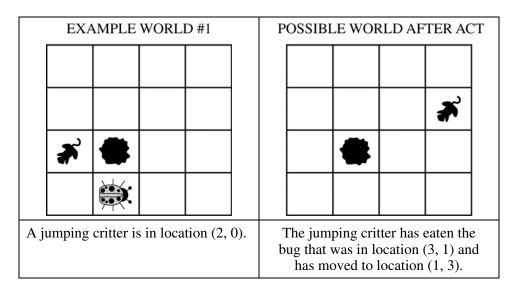
Complete method getEmptyLocations below.

```
/** Gets all the locations in grid that do not contain objects.
  * @param grid a reference to a BoundedGrid object
  * @return an array list (possibly empty) of empty locations in grid.
  * The size of the returned list is 0 if there are no empty locations in grid.
  * Each empty location in grid should appear exactly once in the returned list.
  */
public static ArrayList<Location> getEmptyLocations (Grid<Actor> grid)
```

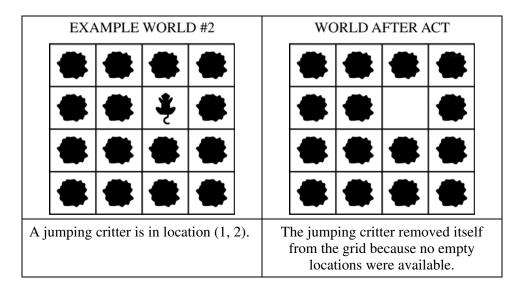
Part (b) begins on page 14.

(b) A JumpingCritter acts like a Critter, except that it moves by jumping to a randomly selected empty location in its grid. If there are no empty locations, the JumpingCritter removes itself from the grid.

The following diagram shows an example of a jumping critter that is able to move to an empty location. Example World #1 is shown below on the left. After the jumping critter at location (2, 0) acts, the world shown below on the right is one possible result.



Example World #2 is shown below on the left. After the jumping critter at location (1, 2) acts, the world shown below on the right is the result.



Class information repeated from the beginning of the question

public class GridWorldUtilities

public static ArrayList<Location> getEmptyLocations(Grid<Actor> grid)

Assume that the GridWorldUtilities getEmptyLocations method works as specified, regardless of what you wrote in part (a). Solutions that reimplement the functionality of this method will not receive full credit.

Write the complete JumpingCritter class. Do NOT override the act method. Remember that your design must not violate the postconditions of the methods of the Critter class.