Blocks Lab

Background: ***`Location location = new Location(0, 0);`***

In this lab, you complete the implemention for a class called `MyBoundedGrid<E>` to represent a grid of objects of type `E`. Throughout the year, we will put various objects into this grid: bugs, critters, chess pieces, blocks, etc. (The grid is "bounded" in the sense that it is not infinite in size.) The `MyBoundedGrid<E>` class makes use of the `Location` class, which simply remembers a row and column index. A summary of the `Location` class is given below, but you will probably only use `getRow`, `getCol`, and `equals` in this lab.

Location Class (implements Comparable)

```
public Location(int r, int c)
public int getRow()
public int getCol()
public Location getAdjacentLocation(int direction)
public int getDirectionToward(Location target)
public boolean equals(Object other)
public int hashCode()
public int compareTo(Object other)
public String toString()

NORTH, EAST, SOUTH, WEST, NORTHEAST, SOUTHEAST,
NORTHWEST, SOUTHWEST, LEFT, RIGHT, HALF_LEFT,
HALF_RIGHT, FULL_CIRCLE, HALF_CIRCLE, AHEAD
```

Go ahead and download all the posted lab files.

Background: ***`MyBoundedGrid<E>`***

The `MyBoundedGrid<E>` class allows us to place objects into a grid, as shown in the following example.

```
MyBoundedGrid grid = new MyBoundedGrid<String>(3, 2);
grid.put(new Location(2, 0), "$");
```

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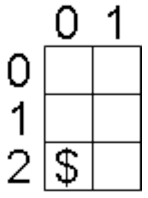
This code creates a grid with 3 rows and 2 columns, containing a `"$"` in the lower left corner, as the following diagram shows.



Here is a summary of `MyBoundedGrid<E>`'s constructor and methods.

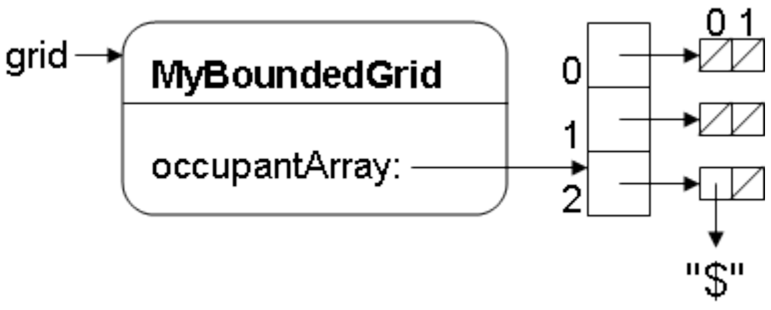
MyBoundedGrid<E> class

```
public MyBoundedGrid<E>(int rows, int cols)
public int getNumRows()
public int getNumCols()
public boolean isValid(Location loc)
public E put(Location loc, E obj)
public E remove(Location loc)
public E get(Location loc)
public ArrayList<Location> getOccupiedLocations()
```

In this lab, we'll use a 2-dimensional array of `Objects` to represent the grid. Your `MyBoundedGrid<E>` class therefore has only a single instance variable. (Don't add any others!)

```
private Object[][] occupantArray;
```

The following instance diagram shows the result of executing the code segment shown earlier.



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Exercise 1: Growing a Grid

Go ahead and complete the `MyBoundedGrid<E>` class you downloaded. Test your code as you go by running the `GridMonster`. Beware – it is rude.

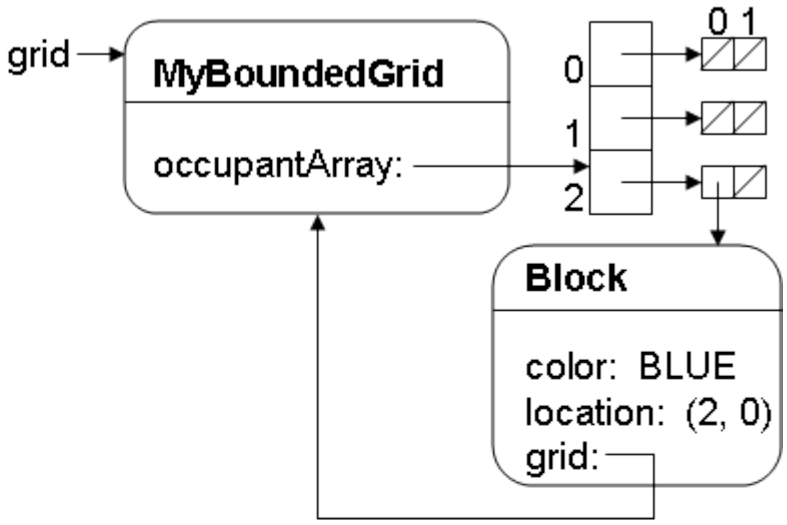
Background: The `Block` Class

The first kind of thing we'll place in our grid is a colored `Block`—an object which keeps track of its color, location, and the `MyBoundedGrid<Block>` that contains it. When the `Block` is *not* in a grid, its `grid` and `location` instance variables are both `null`. When the Block *is* in a grid, its `location` instance variable must match the `Block`'s location within the `MyBoundedGrid` associated with its `grid` instance variable. This means that both the `Block` and its `grid` are keeping track of the `Block`'s location. It's up to the `Block` class to keep these consistent.

The following example shows how to place a `Block` in a `MyBoundedGrid<Block>`.

```
MyBoundedGrid<Block> grid;
grid = new MyBoundedGrid<Block>(3, 2);
Block block = new Block();
block.putSelfInGrid(grid, new Location(2, 0));
```

The following instance diagram shows the result of executing this code.



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Here is a summary of the `Block` class.

<u>`Block` Class</u>

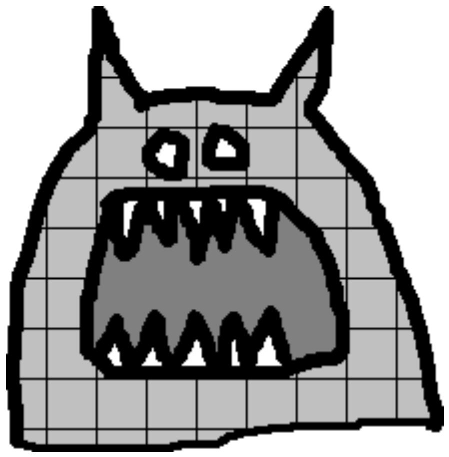
```
public Block()
public Color getColor()
public void setColor(Color newColor)
public MyBoundedGrid<Block> getGrid()
public Location getLocation()
public void putSelfInGrid(MyBoundedGrid<Block> gr, Location loc)
public void removeSelfFromGrid()
public void moveTo(Location newLocation)
public String toString()
```

Exercise 2: Coder's Block

Go ahead and complete the `Block` class you downloaded. You may test your work if you like or wait to use the automated tester in the next exercise.

Exercise 3: Monster Test

Now that you've completed the `MyBoundedGrid<E>` and `Block` classes, it's time to see if you have what it takes to beat the dreaded `GridMonster`!



Go ahead and run the `GridMonster` class you downloaded. Your code must pass each of the `GridMonster`'s tests in order to complete the lab. But beware! The `GridMonster` has a nasty habit of insulting any code that displeases him (or her). Good luck!