CPE 102 Program 3 – Maze Game

Ground Rules

No collaboration is allowed on this program assignment. Your program must be an individual and original effort. Except for any situations explicitly identified in this assignment, if any, you may only receive help from your instructor or the tutors provided by the Computer Science Department.

Due Dates and Submission Instructions

Important: This project has two parts and two handin deadlines. Your Project 3 part 1 will have a test driver that you must pass 100% to get any credit. This driver will become available to you at 6am the day the project is due. Do your own testing! Project 3 part 2 will not have a test driver. You will demo your finished project to your instructor on the specified due date.

Part 1: 80 Points. Due 100% on Friday, 5/1. (10% per day penalty after that until the 50% deadline.)

Part 1 Files: Drawable.java, Square.java, Occupant.java, Explorer.java, RandomOccupant.java, Monster.java, Treasure.java, Maze.java, DrawableSquare.java, DrawableExplorer.java, DrawableMonster.java, DrawableTreasure.java, and DrawableMaze.java

Assuming you are in a directory that only contains files for this project you may handin with the following command (for Professor Workman's class):

```
handin grader-ph 102project3-jw-100 *.java
```

Students in Prof. Parkinson's class will hand in to:

```
handin grader-ph 102project3-dp-100 *.java
```

Part 2: 20 Points. Due for handin *and* demo on Friday 5/8. This is your only chance to demo and you will receive a grade based on what you have accomplished.

Part 2 files: Drawable.pde, Square.pde, Occupant.pde, Explorer.pde, RandomOccupant.pde, Monster.pde, Treasure.pde, Maze.pde, DrawableSquare.pde, DrawableExplorer.pde, DrawableMonster.pde, DrawableTreasure.pde, DrawableMaze.pde, and MazeGame.pde (whether or not you altered it)

Assuming you are in a directory that only contains files for this project you may handin with the following command (for Prof. Workman's class):

```
handin grader-ph 102project3p2-jw *.pde
```

Students in Prof. Parkinson's class will hand in to:

```
handin grader-ph 102project3p2-dp *.pde
```

Testing With the Provided Test Driver

1. The test driver will be published at 6am on the due date for Part 1.

2. You should develop and use your own tests prior to using the provided test driver. Do not use the provided test driver until your solution is complete and you believe it is correct or you are likely to be overwhelmed with error messages and will spend unnecessary time just trying to understand the test driver - a frustrating and inefficient way to approach problem solving with computers!

3. Using the ***save-as feature of your browser, not cut-and-paste***, save P3TestDriver.java in the same directory as all of the source files (.java files). Or you may copy it from the command line:

   ```
   cp ~jworkman/www/102/Project03/P3TestDriver.java .
   ```

4. Compile the P3TestDriver.java, all of your source files (.java files) and run P3TestDriver. Remember that your code will be graded on unix1 (2, 3, or 4) so, to avoid unpleasant grading surprises be sure to test on one of those machines just before handing it in. *The test driver is only meant to test **Part 1** of your project.*

Demoing your Project

You will be required to demo Part 2 of your project to your instructor in lab.

Learning Objectives:

- To be able to **design, code, and test** a Java **abstract class**.
- To be able to **design, code, and test** a collection of Java **classes** that constitute a **class hierarchy**.
- To be able to **design, code, and test** Java **classes** that **implement an interface**.
- To be able to **use objects and methods** of the Processing graphics library to draw graphic shapes.
- To be able to **design, code, and test** a Java **class** that uses an array of **polymorphic object references**.
- To gain further practice using java arrays and Arraylists.

Problem Description

In this project you will be implementing a maze game. Your game will consist of a maze filled with treasures and monsters. An explorer must navigate the maze and find all the treasures before it runs into a monster.

I will demo a working version of the maze in lab. This version has a 10x10 maze containing 3 treasures and 2 monsters. The explorer is represented by a brown cat. Treasures are gray pieces of cheese until they are found. At that time they turn yellow.

Monsters are gray bulldogs. Don't run into these or your game will be over! Additionally, the explorer cannot see the entire maze at the start of the game. The maze is revealed as the explorer travels through it. Monsters move about randomly (they aren't too smart), but you can't see them unless they are in a square right next to you and there is no wall in-between. Your explorer does not have x-ray vision!

In your version of the game you will design your own explorer/monster/treasure theme. The backend (the model) of the game will run the same as the instructor version, however you will get to decide what your objects look like when they are drawn (the view).

To implement the game you must do the following:

- You will implement a *hierarchy of classes* that represent **Occupants** of the maze game including **Explorer**, **Monster**, and **Treasure**. Objects constructed from these classes have some common properties inherited from the **Occupant** class such as a location in the maze (**Square**). **Explorer** objects also have a name property and the ability to move at the direction of the game player. **Treasures** and **Monsters** can have randomly generated starting locations in the maze.

- Additionally, you will implement the following classes: **DrawableSquare, DrawableExplorer, DrawableMonster,** and **DrawableTreasure.** Objects constructed from these classes "know how to draw themselves", that is they have a method named `draw` that can be called to draw their image in the **Maze**. Although there are three different concrete classes descendant from the **Occupant**, we wish them all to have the same method specification for drawing themselves. This is necessary so that a collection (array) of different classes of **Occupant** objects may all be drawn from the **Maze** class with the same method call within a loop. To do this you will need to *implement an interface* for that drawing method.

- You will additionally design a **Maze** class that consists of a 2D array of maze **Squares**. The **Maze** class contains the basic game logic and knows how to move its **Occupants** around the **Maze**. A **DrawableMaze** has a method to command all of its **Squares** and **Occupants** to draw themselves.

- You will first implement all the non-drawable versions of each class. All of the game logic is contained in these classes. The only difference is that they do not know how to draw themselves in the Processing environment. However, the P3TestDriver.java expects all of your classes to be present, but does nothing to test the draw method of the **Drawable** classes. Part 1 of the project expects your `draw` methods to be empty. Get your code working to this point and tested before starting on Part 2!

- Of course, creating a working Maze game is the ultimate goal of this project. In Part 2 you will write code to have each class draw itself on the screen. *Do not*

work on the draw() methods of the Drawable versions of each of your classes until you believe your have their non-drawable versions working perfectly!!!

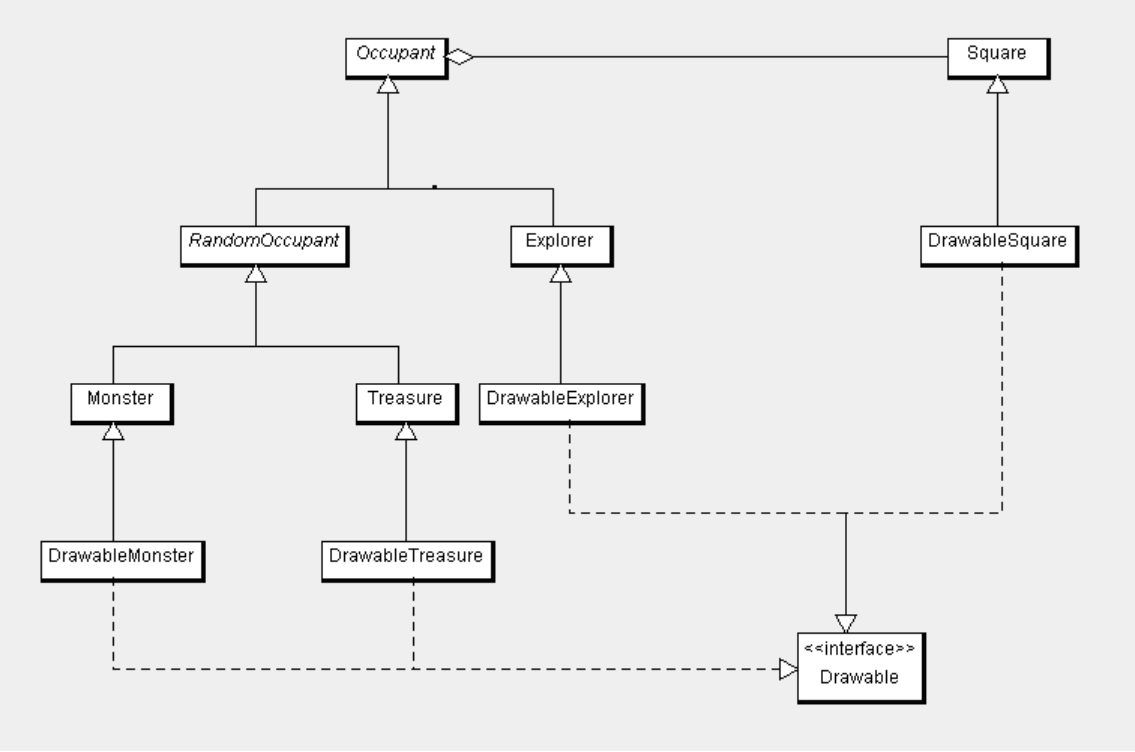
- A goal of your learning for this assignment will be how to *reuse class specifications through inheritance* and how to use a standardized *interface* for the drawing operation. To complete the program and its classes you will be required to use abstract classes, as well.

Part 1 Specification

These are the requirements for the classes that you must implement. I ***highly*** recommend creating skeletons of all the non-drawable classes, with stubs for the required methods, before you do any implementation. Get your entire system compiling before you fill in any one class. Then compile and test your classes as you go.

Get your non-drawable classes implemented first! Then create the drawable versions with empty draw methods. Passing the Part 1 test driver will earn you the largest portion of points for the project.

To give you an overview of some of the classes you will be designing, here is a UML diagram of the system. Note that the Maze and DrawableMaze classes are not pictured. Also, the abstract classes are shown in italics.



Square

Develop a class to represent a **Square** in the **Maze**. To be compatible with the test drivers that will be used to grade your program you must name this class **Square**.

The specifications for this class are:

Named Constants:

- A public int SQUARE_SIZE set to 50 (number of pixels per **Square**)
- A public int UP set to 0
- A public int RIGHT set to 1
- A public int DOWN set to 2
- A public int LEFT set to 3

Fields (instance variables):

- A java array of four boolean values to represent the walls of the **Square**. (i.e. Does the **Square** have a wall in that direction?)
- A boolean to keep track of whether the **Square** has been seen or not
- A boolean to keep track of whether the **Square** is currently in view or not
- Two integers to keep track of the row and column of the **Square**
- A **Treasure** reference to keep track of the treasure (if any) in that **Square**.

Constructors:

- `public Square(boolean up, boolean right, boolean down, boolean left, int row, int col)`

A constructor to initialize the walls array and the row and column. The booleans to keep track of "seen" and "inView" should default to false. The Treasure reference starts out null.

Methods:

- `public boolean wall(int direction)` - a query for a wall in the given direction.
- Create query methods for seen, inView, row, col, and treasure. Name them `seen()`, `inView()`, `row()`, `col()`, and `treasure()`.
- `public int x()` - a query for the x-value (in pixels) of the upper left corner of the **Square**. Use row and/or column, and SQUARE_SIZE to determine this.
- `public int y()` - a query for the y-value (in pixels) of the upper left corner of the **Square**. Use row and/or column, and SQUARE_SIZE to determine this.

- **`public void`** `setInView(`**`boolean`** `inView)` - a command to tell the **Square** if it is currently in view of the **Explorer**. This command should also set the `seen` variable to true if the value of `inView` is true. (If it has been in view once then it logically has been seen.)
- **`public void`** `setTreasure(Treasure t)` - sets the treasure reference to the parameter `t`.
- **`public void`** `enter()` - a command to tell the **Square** that the **Explorer** has entered it. Simply check to see if **Square** contains a **Treasure**, and if it does, invoke the treasure's `setFound()` method.

<<abstract>> Occupant

Develop an abstract class that includes properties common to all maze occupants. To be compatible with the test drivers that will be used to grade your program you must name this class **Occupant**. This class is designed to be extended, and as such, is abstract even though it contains no abstract methods.

The specifications for this class are:

Fields (instance variables):

- a **Square** (see Square class above) representing the location of the occupant in the maze

Constructors:

- **`public`** `Occupant()` - a default constructor that does not initialize anything
- **`public`** `Occupant(Square start)` - a constructor that accepts a **Square** argument to initialize the **Occupant**'s location

Methods:

- **`public`** `Square location()` - a query method for the location
- **`public void`** `moveTo(Square newLoc)` - a command to change the Occupants location

Explorer

Develop a *class* that *extends* **Occupant** to model an **Explorer**. To be compatible with the test drivers that will be used to grade your program you must name this class **Explorer**. Because an **Explorer** *is-an* **Occupant**, you can query it for `location()` and move it to a new location using `moveTo()`.

The specifications for this class are:

Fields (instance variables):

- a **String** name
- a reference to the **Maze** that it inhabits so that it may locate itself and move about the **Maze**.

Constructors:

- **`public`** `Explorer(Square location, Maze maze, String name)` - a constructor to initialize all the instance variables. Lastly, be sure to call the `lookAround` method of the **Maze** to reveal the squares that the **Explorer** can initially see.

Methods:

- **`public`** `String name()` - query for the name.
- **`public void`** `move(`**`int`**` key)` - command the **Explorer** to move a direction in the **Maze** based on a key press from the user. The **Explorer** does not move itself randomly around the **Maze** like a **RandomOccupant,** but instead is built to respond to key presses from the user. This key press information is passed to the `move` method of the **Explorer**. Key presses in this game will be arrow keys, which have pre-defined values in the **KeyEvent** class. Look up the values of the *named constants* for the non-numpad and numpad arrow keys (in the java class libraries). Steps to accomplish the `move` method:

    1. Get the row and column of the current location.
    2. Determine the key pressed, if not an arrow key, do nothing. If it was an arrow key, figure out which direction and adjust the row and column numbers accordingly.
    3. Check the **Explorer**'s current location to see if there is a wall in the chosen direction. If not, get the desired **Square** from the **Maze** and call the **Explorer**'s `moveTo` method. If there is a wall in the chosen direction, do nothing.

    Hints (*some* of the methods you will need):

    Maze's `getSquare` method.
    Square's `wall` method
    Explorer's `moveTo` method.

- **`void moveTo(Square s)`** - command the **Explorer** to move to another **Square** in the **Maze**. The actual moving of the **Explorer** is done via its parent's `moveTo` method. Be sure to call that method within this one. In addition to actually changing locations, the **Explorer** needs to notify the given **Square** that it has been entered by the **Explorer**. Call the appropriate method of the **Square** class to do this. Finally, inform the **Maze** that the **Explorer** would like to `lookAround` from the newly entered **Square**.

<<abstract>> RandomOccupant

Develop an abstract class that *extends* **Occupant** to include properties common to all not human-controlled maze occupants, namely: know how to generate a random **Square** as its initial location and know how to move randomly around the **Maze**. To be compatible with the test drivers that will be used to grade your program you must name this class **RandomOccupant**.

The specifications for this class are:

Fields (instance variables):

- a reference to a **Random** object used to generate random numbers for movement and initial location
- a reference to the **Maze** that it inhabits so that it may locate itself and move about the **Maze**.

Constructors

- **`public`** `RandomOccupant(Maze maze)` - a constructor to initialize the maze variable and randomly set its location in the maze. To do so, it will need the following methods:

  From **Maze**: `rows, cols, getSquare`
  From **Occupant** (its parent): default constructor, `moveTo`

- **`public`** `RandomOccupant(Maze maze, long seed)` - a constructor to initialize the maze variable and randomly set its location in the maze, just like the above constructor. Additionally, this constructor has a seed to use when constructing the Random number generator. The test driver relies on this constructor so be sure to call the constructor for the Random Number generator that takes a seed.
- **`public`** `RandomOccupant(Maze maze, Square location)` - a constructor to initialize the maze variable and the location of its parent.

(This constructor is used if the location of the RandomOccupant needs to not be random.)

Methods:

- **`public void`** `move()` - this method is responsible for moving the **RandomOccupant** in a random fashion. The move must be legal, however, so that it does not move through any walls in its current location. Steps to accomplish this task:

  1. Get the row and column of the current location.
  2. Generate a random integer between 0-3 (inclusive) to represent a direction to move. (Note that these directions are named constants in the **Square** class). Repeat until a valid direction is generated. A valid direction is one in which no wall is in the way.
  3. Adjust the row and column numbers accordingly depending on the direction moved. You must use the named constants in the **Square** class instead of the literals 0, 1, 2, and 3.
  4. Get the **Square** from the **Maze** that is in the row and column the **RandomOccupant** is supposed to move to and then move the **RandomOccupant** to that location. You will need **Maze**'s `getSquare` method.

Monster

Develop a *class* that *extends* **RandomOccupant** to model a **Monster**. To be compatible with the test drivers that will be used to grade your program you must name this class **Monster**. Usually **Monsters** begin the game in a random location, although you will also provide a constructor that can place the **Monster** in a specific location in the **Maze**. **Monsters** then move randomly about the **Maze**. If they run into the **Explorer**, the **Explorer** dies and the game is over. The random initial placement and the random movement is taken care of by **Monster**'s parent class, **RandomOccupant**. The Monster class exists for two reasons:

- To be able to differentiate between other **RandomOccupants** that do not kill **Explorers**.
- To extend to the **DrawableMonster** class.

The specifications for this class are:

Fields:

- None

Constructors:

- **public** `Monster(Maze maze)` - constructor to randomly locate itself in the **Maze**. (Remember, the parent of this class is **RandomOccupant**.)
- **public** `Monster(Maze maze, long seed)` - constructor to randomly locate itself in the **Maze** with a seed for the Random class.
- **public** `Monster(Maze maze, Square location)` - constructor to generate a **Monster** in a specified location in the **Maze**.

Treasure

Develop a *class* that *extends* **RandomOccupant** to model a **Treasure**. To be compatible with the test drivers that will be used to grade your program you must name this class **Treasure**. Usually **Treasures** begin the game in a random location, although you will also provide a constructor that can place the **Treasure** in a specific location in the **Maze**. Even though **Treasures** extend **RandomOccupant**, they may not move about the Maze, so you will override the Treasure's inherited move method. The **Explorer** must collect all the **Treasures** in the Maze before encountering a **Monster** to win the game. The random initial placement is taken care of by **Treasure**'s parent class, **RandomOccupant**. **Treasure** must simply add code to override the move method..

The specifications for this class are:

Fields:

- a boolean representing whether or not the treasure has been found by the **Explorer**

Constructors:

- **public** `Treasure(Maze maze)` - constructor to randomly locate itself in the **Maze**. (Remember, the parent of this class is **RandomOccupant**.) The found variable should be intialized to false. In the constructor, the object must also send itself (using `this`) to the `setTreasure` method of the **Square** it resides in.
- **public** `Treasure(Maze maze, long seed)` - constructor to randomly locate itself in the **Maze** using a seed. (Remember, the parent of this class is **RandomOccupant**.) The found variable should be intialized to false. In the constructor, the object must also send itself (using `this`) to the `setTreasure` method of the **Square** it resides in.
- **public** `Treasure(Maze maze, Square location)` - constructor to generate a **Treasure** in a specified location in the **Maze**. The found variable should be initialized to false. In the constructor, the object must also send itself (using `this`) to the `setTreasure` method of the **Square** it resides in.

Methods:

- **`public boolean`** `found()` - query method for the found value
- **`public void`** `setFound()` - sets the found value to `true`
- **`public void`** `move()` - override the move method of **RandomOccupant** so that it does nothing. Note that a **Treasure** may still be moved via the `moveTo()` method, but cannot move itself randomly about the **Maze**.

Maze

Complete the implementation of the **Maze** class. This class contains most of the game logic. Complete all the code where I say "CHANGE" in a comment. I recommend you remove the word "CHANGE" whenever you implement a part of it, so you know you are done when all the CHANGES are gone. The instructions for this class are in the code.

Drawable

Define the ***Drawable*** interface. This must be placed in a file named **Drawable.java**.

Methods:

- **`public void`** `draw();`

STOP and READ before you move on:

The following specifications are for the Drawable versions of your classes. When you first create these classes, leave the `draw()` method empty. That is all you need to do to pass the Part 1 test driver. The specifications below include how you should draw each item *once you convert to Processing* but don't worry about actually implementing the drawing part yet.

DrawableSquare

Extend the **Square** class and implement the ***Drawable*** interface so that the DrawableSquare knows how to draw itself in the Processing window.

The specifications for this class are:

Constructors:

- **`public`** `DrawableSquare(`**`boolean`** `up,` **`boolean`** `right,` **`boolean`** `down,` **`boolean`** `left,` **`int`** `row,` **`int`** `col)` - a constructor to initialize all the data needed in the parent class.

Methods:

- **`public void`** `draw()` - Instruct the **DrawableSquare** to draw itself *in the appropriate spot on the screen*.

  If the **DrawableSquare** *has not* been seen: Don't draw anything.

  If the **DrawableSquare** *is currently in view*: Draw the entire square in the color scheme of your choice. Be sure to draw walls in the proper places on your square in the theme of your choice.

  If the **DrawableSquare** *has been seen, but is not currently in view*: Draw the entire square in the color scheme of your choice, but make sure the color scheme is darker than you would draw for a square that is currently in view. Be sure to draw the walls here, as well. Your explorer has a good memory!

  Hints:

  Use the `x()` and `y()` query methods to get the x and y coordinate of the **DrawableSquare's** upper left pixel. Derive the rest of your pixel calculations from there.

  See Lab 8 for detailed help using the Processing Libraries.

DrawableExplorer

Extend the **Explorer** class and implement the ***Drawable*** interface so that the DrawableExplorer knows how to draw itself in the Processing window.

The specifications for this class are:

Constructors:

- **`public`** `DrawableExplorer(Square location, Maze maze, String name)` - a constructor to initialize all the data needed in the parent class.

Methods:

- **`public void`** `draw()` - Instruct the **DrawableExplorer** to draw itself *in the appropriate spot on the screen*.

  Draw your explorer in the appropriate place on the screen using methods of the Processing Development Environment. Be sure your explorer matches your chosen theme.

DrawableMonster

Extend the **Monster** class and implement the ***Drawable*** interface so that the DrawableMonster knows how to draw itself in the Processing window.

The specifications for this class are:

Constructors:

- **public** `public DrawableMonster(Maze maze)` - a constructor to initialize all the data needed in the parent class for a Monster with a random location.
- **public** `public DrawableMonster(Maze maze, long seed)` - a constructor to initialize all the data needed in the parent class for a Monster with a random location and a seeded Random number generator.
- **public** `public DrawableMonster(Maze maze, Square location)` - a constructor to initialize all the data needed in the parent class for a Monster with a given location.

Methods:

- **public void** `draw()` - Instructs the **DrawableMonster** to draw itself in the appropriate spot on the screen -- if the **Square** it currently occupies is `inView` of the explorer.

  Draw your monster in the appropriate place on the screen using methods of the Processing Development Environment. Be sure your monster matches your chosen theme.

  Use the code that you created in Lab 11 to draw your monster!

DrawableTreasure

Extend the **Treasure** class and implement the ***Drawable*** interface so that the DrawableMonster knows how to draw itself in the Processing window.

The specifications for this class are:

Constructors:

- **public** `public DrawableTreasure(Maze maze)` - a constructor to initialize all the data needed in the parent class for a Treasure with a random location.
- **public** `public DrawableTreasure(Maze maze, long seed)` - a constructor to initialize all the data needed in the parent class

for a Treasure with a random location and a seeded Random number generator.

- **public** `public DrawableTreasure(Maze maze, Square location)` - a constructor to initialize all the data needed in the parent class for a Treasure with a given location.

Methods:

- **public void** `draw()` - Instructs the **DrawableTreasure** to draw itself if the **Square** it currently occupies *has been seen* by the **Explorer**.

  Draw your monster in the appropriate place on the screen using methods of the Processing Development Environment. Be sure your monster matches your chosen theme.

  You must draw your treasure differently depending on whether or not the Treasure has been found.

DrawableMaze

Extend the **Maze** class and implement the ***Drawable*** interface so that the DrawableMonster knows how to draw itself in the Processing window.

The specifications for this class are:

Constructors:

- **public** `DrawableMaze (DrawableSquare[][] maze, int rows, int cols)`- a constructor to initialize all the data needed in the parent class. Notice that the array of **Squares** required for **Maze** is an array of **DrawableSquares** for **DrawableMaze**. Can we pass the array of **DrawableSquares** to the parent constructor?

Methods:

- **public void** `draw()` - Instruct the **DrawableMaze** to draw itself *in the appropriate spot on the screen*. Do this by drawing a rectangle the size of the entire maze in the color of your choice that matches your theme. The color you chose should represent unseen portions of the maze (e.g. dark green in the instructor version).

  Next, instruct each **Square** in the **Maze** to draw itself. Note that **Squares** don't have a `draw` method, and the code won't compile if we try to call the `draw` method on a **Square** retrieved via the `getSquare` method.

But, we know they must really be **DrawableSquares**. What can we do to call the draw method of these **DrawableSquares**?

Then, instruct all the **RandomOccupants** in the **Maze** to `draw` themselves. We run into the same problem as above. Note that you do NOT have to determine whether each **RandomOccupant** is really a **Treasure** or a **Monster**.

Finally, instruct the **Explorer** to draw itself.

Documentation Requirements

Your class files MUST include the following documentation as Java comments.
==> The grader will deduct points from your grade if any of these are missing.
File header comments:

1. **Filename**
2. **Class Title and description**: one sentence description of what the program/class does
3. **Author's name and section** -- use Javadoc tag @author
4. **Date** -- use Javadoc tag @version

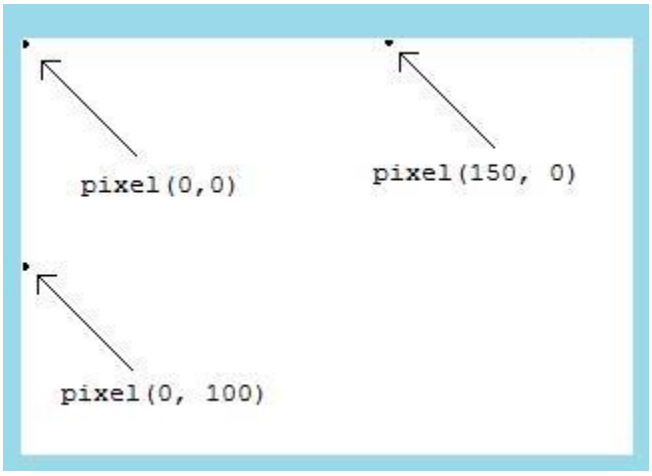
Running the Test Driver

Implement all the non-drawable classes first (and the Drawable classes with the draw() method empty) and test them with the provided P3TestDriver. This will get you most of the points available for the project.

Part 2 Info

To use objects of the **Drawable** classes you design you will use a GameGUI class that manages the GUI (graphical user interface) and calls the methods of the **DrawableMaze** class to run the game. The GameGUI class is given to you in a Processing file named MazeGame.pde. The GameGUI class has a draw method (called from the main Processing draw method) that will ask the **DrawableMaze** to draw itself and its occupants. It will also print a final message to the screen when the game is over. Calling methods of the Processing development environment is how the **DrawableMaze** and its **Occupants** get displayed on the screen. The **DrawableMaze** class will simply store an array of **Occupants** and call the `draw` method of each of them. The correct `draw` method for each **Occupant** object will be called because of *polymorphism*. That is, if the **Occupant** is actually a **Treasure**, then the **Treasure** class `draw` method will be invoked.

Drawing in the Processing Development Environment is done in terms of pixels in an x/y coordinate system. The (0,0) pixel location is at the upper left corner of the screen. Positive x is to the right. Positive y is down.



The **Maze** is kept as an array of **Square** objects. Row 0 is the top most row. Column 0 is the left most column.

Note that pixels are in (x,y) and Squares are in (row,col). The pixel at (0,3) is on the far left of the screen, 3 pixels down from the origin. However, the Square at (0,3) is in the first row, but in the third column from the left of the screen. Keep this in mind when you do row/col to pixel conversion.

Okay, now what? How do I actually draw in the Processing environment? Once you have finished the "backend" of the maze game, you should begin to work on the `draw()` method of the Drawable versions. Lab 8 (released Friday 5/2) will be an excellent introduction into the Processing Development Environment. Complete that lab before you attempt completing the drawable portion of this Project.

Solution Requirements

Do THIS when your backend is complete and you are ready to DRAW:

Converting to Processing

1. Download the given MazeGame.pde file and place it in a directory named MazeGame. You may alter this file in the one spot where it says CHANGE to give the explorer a name appropriate to your theme.

2. Download the given MazeGenerator.pde file and place it in the same directory. This file contains all the necessary code to generate a random maze each time you run your program.

3. Move all your code into the same directory (except for the P3TestDriver if you have it).

4. Change all your file extensions to .pde.

5. Finally, add this font to your sketch by downloading the file. Then in the Processing window, click Sketch->Add File. Add the font to your sketch. It is used in the final scene.

Now you are ready to start drawing! You should be able to run the Processing sketch, which won't do a whole lot yet. If your Monster draw method is complete from Lab 8 you should see the Monsters moving around the screen.

Begin implementing the draw methods for each class that implements the Drawable interface and your Maze Game will start to come to life.