Java Final Project: Things **Wednesday, June 29, 2005**

Have fun!

0. Copy `ThingsGUI.java` and `Thing.java` into a folder on your computer.

Open the copied files in JCreator.

Compile both files.

Execute `ThingsGUI.java`, and try clicking in the window.

Close the window when you are done.

You should NEVER change `ThingsGUI.java`. It is VERY complicated and your program will not work if you change it.

1. Try changing `BACKGROUND` and `WIDTH` and `HEIGHT` to other values.

Compile. Execute `ThingsGUI.java`

Close the window when you are done.

2. Now try changing the color of the `Thing`s. Where should you change this?

Compile and execute.

3. Change the `move` method to move the `Thing` one pixel to the right.

Compile and execute.

As you add `Thing`s by clicking in the window, they should all move to the right. If they don't do this, try again or ask James or Harold for help.

4. Make the `button` method remove the last element of `things`.

Use `things.remove(int index)` and `things.size()` and make sure to check that `things` is not empty!

Compile and execute.

Now you can delete things by clicking on "button".

5. Change `move` so that when a `Thing` goes past the right edge of the window, it starts again at the left edge of the window.

(Hint: Add an `if` statement. The left edge of the `Thing` is at the right edge of the window when `(x-size)==WIDTH`. You can place the right edge of the `Thing` at the left edge of the window with `x=-size;`)

Compile and execute.

6. Change the constructor of `Thing` so that `color` has a random red component, a random green component, a random blue component, and a random alpha component.

(Hint: `Math.random()` already returns a number between 0.0 and 1.0. Use it 4 times.)

Compile and execute.

Now every `Thing` should have a different color!

7. Change `paint` to draw a red rectangle around the circle. (Hint: use the method `g.drawRect(int top, int left, int width, int height)` and use the color `Color.RED`)

Compile and execute.

8. Change `click` so that it adds **two** new `Things` to `things`, one at (`x`,`y`) and the other at (`x`,`HEIGHT-y`).

Compile and execute.

Show Harold or James your program, before you move on.

Now it's your turn! Change `Thing` to do whatever you want it to.
Here are some suggestions if you're having trouble thinking of something:

* Change `button`. You can have `button` use a `for` loop to loop through `things` and assign each one a new color or a new size (for example, try setting the `size` of each one to `(int)(50*Math.random())`.)

* Change `paint`. You can make a `Thing` look like whatever you want!

Use `g.setColor()` and some of `g.drawRect()`, `g.drawOval()`, `g.fillRect()`, `g.fillOval()`. You can even use `g.drawString (String s, int bottom, int left)` which writes a `String` on the screen! Or try using random colors inside `paint`, because they will change 50 times per second!

* Change `move`. You could add a new speed field to `Thing`, so that each `Thing` moves at a different speed.

You can make the `Things` move randomly or go in circles or in sine waves (you can use `Math.cos(double x)` and `Math.sin(double x)`) or have them move faster or slower.

You could add an `xSpeed` and `ySpeed` field, so that `Things` can go in any direction, and then you could make them bounce off of the sides of the

window.

* Change `click`. **Difficult:** You could loop through `things` and if any `Thing` was clicked on, then you could change its size or color or do something else with it. (Hint: if you have a `Thing t;` then the distance between the location of the click and `t` is `Math.hypot(x-t.x,y-t.y)`, which you can compare to `t.size` to decide if the `t` was clicked on.)