CMPS 5J  
Introduction to Programming in Java  
Programming Assignment 4 (100 Points)

In this assignment you will write a processing program that uses boolean variables and conditional statements (if and if-else) to emulate as accurately as possible, the behavior of a program posted on the class webpage at:

https://classes.soe.ucsc.edu/cmps005j/Fall15/Examples/ColorButtons.html

Note the above link takes you to program that runs in your web browser, but that no source code is provided. Your task is to reverse-engineer this program, to write a Processing program that does exactly what it does.

Follow the link, play with the program and analyze its behavior. Observe that three buttons colored red, green and blue are displayed. When you press the mouse outside of any button nothing happens. When you press the mouse inside one of the buttons it changes the background to the color of the button. Notice that each button acts as a toggle-switch (as opposed to a hold down button), turning the color on and off whenever the mouse is pressed inside the button. This is essentially the same behavior as the example Switch discussed in class and posted in the examples section of the webpage. Notice also that more than one color can be turned on at the same time. For instance, if you press red then green the background will be yellow, which is a mixture of red and green. If you turn off red and turn on both green and blue, you get a mixture of green and blue called cyan. A moment’s thought reveals that the program has 8 possible background colors corresponding to all possible combinations of on-off positions for the 3 switches.

<table>
<thead>
<tr>
<th>Color</th>
<th>Red</th>
<th>Green</th>
<th>Blue</th>
</tr>
</thead>
<tbody>
<tr>
<td>black</td>
<td>off</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>blue</td>
<td>off</td>
<td>off</td>
<td>on</td>
</tr>
<tr>
<td>green</td>
<td>off</td>
<td>on</td>
<td>off</td>
</tr>
<tr>
<td>cyan</td>
<td>off</td>
<td>on</td>
<td>on</td>
</tr>
<tr>
<td>red</td>
<td>on</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>magenta</td>
<td>on</td>
<td>off</td>
<td>on</td>
</tr>
<tr>
<td>yellow</td>
<td>on</td>
<td>on</td>
<td>off</td>
</tr>
<tr>
<td>white</td>
<td>on</td>
<td>on</td>
<td>on</td>
</tr>
</tbody>
</table>

Note that when you run this program in your web browser, the name of the current color is printed in a message window below the processing window. When you run your program in the Processing Development Environment (PDE) editor, these names will be printed to the console tab below the editor window.

Note also that each button has a thick gray boundary, and when a color is on, the button has an additional thin black boundary within the gray boundary. Observe also that the mouse must be within the colored area of the button for a mouse press to have an effect. Mouse presses within the gray boundary do not activate the switch.

The Switch example is a very good starting point for this project. In particular, your program should include the built-in function mousePressed(). It is recommended that you declare boolean variables to detect when the mouse pointer is within one of the buttons (suggested variable names: mouseInRed, mouseInGreen, mouseInBlue.) It is also recommended that you define boolean variables to keep track of which colors are on (suggested variable names: redOn, greenOn, blueOn.) Keep in mind that these are recommendations only, not program requirements.
The following facts may be useful in drawing your figures correctly. The processing window is 500x500 pixels. Each button is a 100x100 square. The space between adjacent buttons, and between the outermost buttons and the edge of the processing window is 50 pixels. The gray boundaries are 12 pixels wide (strokeWeight(12)) and the thin black boundaries are 2 pixels wide (strokeWeight(2)). Your program should have the following general form.

```java
// userid
// cmps 5J
// pa4

// variable declarations
void setup(){
   // initialization commands
}
void draw(){
   // commands that are executed once per frame
}
void mousePressed()
   // commands that are executed once per mousePress
}

Most students should find this assignment to be more challenging than previous ones. For that reason you are given more than the usual week to complete it (about 10 days). Even still, you are urged to start early, formulate questions as they arise, and get help from the instructor, TAs and tutors. Call your program ColorButtons. Submit the file ColorButtons.pde to assignment pa4 on eCommons.