Java Inheritance – Color

Purpose

This lab was designed to solidify your understanding of class design by defining classes, extending classes, instantiating objects via constructors, accessing objects thru reference variables, declaring private attributes with the appropriate accessor and mutator methods, and encapsulating data fields.

Color.java and AlphaColor.java

Write a class called Color.java that has 3 private attributes of type int called red, green, and blue in the range of 0-255 inclusive. The class has 2 constructors, the no-arg (default or non-parameterized) sets the color to black (all zeros) and an initialization constructor (parameterized). Add mutators and accessor for all 3 fields and a toString(). The toString should return the r, g, b components int the format: "#(125,30,210)". Any RGB values out of range should use 0 or 255 for negatives and values greater than 255 respectively.

The subclass AlphaColor has an int instance variable, alpha, containing the alpha value, which represents the degree of transparency of the color (0 is completely transparent and 255 is opaque). Add an accessor for the alpha variable.

AlphaColor has a method named dissolve (void, and no parameters), that causes the color to fade a bit. It does so by incrementing the three color components by 1 if possible. Add a method precipitate that is the inverse of dissolve. Override the toString by adding the alpha component with transparent, translucent, and opaque for alpha levels [0,100], [101, 200] and [201, 255] respectively. Use the format "#(125,30,210)(opaque:255)"

AlphaColor has 2 constructors. One constructor receives four integers representing the red, green, blue, and alpha components. The other receives 4 doubles and one integer (the alpha). The primary format for publishing books and magazines—known as the *CMYK format*—specifies the level of cyan (C), magenta (M), yellow (Y), and black (K) on a real scale from 0.0 to 1.0.

Convert CMYK format to RGB format using these mathematical formulas(round to the nearest integer):

white = 1 − black

red = 255 × white × (1 − cyan)

green = 255 × white × (1 − magenta)

blue = 255 × white × (1 − yellow)

Sample Data

```
// Create a red color
Color c = new Color(255, 0, 0);
out.println(c);

// change it to white
c.setBlue(255);
c.setGreen(255);
out.println(c);

// Create an AlphaColor green that is opaque
AlphaColor green = new AlphaColor(0, 255, 0, 255);
out.println(green);

// test dissolve/precipitate
green.precipitate();
out.println(green);
green.dissolve();
out.println(green);

// Create an AlphaColor using the CMYK constructor
AlphaColor magenta = new AlphaColor(0.0, 1.0, 0.0, 0.0, 0);
out.println(magenta);

 // Create an AlphaColor using the CMYK constructor
AlphaColor orange = new AlphaColor(0.0, 0.4392156862745098, 1.0, 0.0, 200);
out.println(orange);
```

Sample Execution

```
#(255,0,0)
#(255,255,255)
#(0,255,0)(opaque:255)
#(0,254,0)(opaque:254)
#(1,255,1)(opaque:255)
#(255,0,255)(transparent:0)
#(255,143,0)(translucent:200)
```